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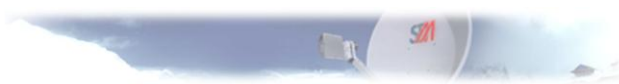


SatLink VSAT User Guide

User Guide

Revision 14.1.1-2 – January 12th 2012





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1. Introduction

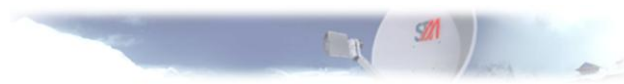
The SatLink 1000, 1910, 2000, and 2900 are the indoor units (IDUs) of the SatLink family of DVB-RCS VSATs. They perform several functions: they are satellite modems (at Layer 1); they handle data link layer processing (at Layer 2) for both satellite and LAN communications; and they act as IP routers and DHCP servers (at Layer 3). All SatLink IDUs provide an Ethernet 10/100 LAN interface for one or more PCs to engage in two-way communication via a SatLink (or any DVB-RCS compliant) satellite network.



Figure 1: SatLink 1000, 1910, 2000, and 2900 Indoor Units (IDUs)



Figure 2: SatLink Outdoor Unit (ODU)



1.1 About this User Guide

This User Guide covers the installation and operation of the SatLink 1000/1910/2000/2900, commonly also referred to as the indoor unit (IDU) of the DVB-RCS VSAT, together with the accompanying outdoor unit (ODU) equipment. It is intended for DVB professionals, such as service providers and installers. Therefore, it does not contain information for non-professional users, such as given in the user manuals of consumer electronic products. The information given pertains to the following STM software (SW) and hardware (HW) versions and releases:

SatLink IDU Software

- STM SatLink Boot loader, P/N 101225, SW build 1.8.0.2 and later
- STM SatLink Boot loader, P/N 106267, version 9.0.0 and later
- STM SatLink Boot loader, P/N 120044 , Revision 14.0.0 and later
- STM SatLink Boot loader, P/N 120511, Revision 14.1.0 and later
- STM SatLink DVB-RCS VSAT Software, P/N 120208, version 14.1.0 and later

SatLink VSAT IDU Hardware models

- STM SatLink 100 DVB-S2 Plug-in card for SatLink 1910, P/N 107261
- STM SatLink 1000, P/N 103346
- STM SatLink 1910, P/N 103798
- STM SatLink 2000, P/N 120033
- STM SatLink 2900, P/N 120510

Ku-band Equipment

Transceivers

- STM SatLink 4033, P/N 104804
- STM SatLink 4035, P/N 106546

1.2 Initial Configuration

The VSAT IDU must be configured before it can communicate via the satellite to and from the network Hub. The parameters to be configured are explained in section 6.2.

The configuration of the VSAT IDU can be carried out using the following configuration tools:

- Web-interface (basic configuration only)
- Command Line Interface (CLI)
 - Via RS232/Terminal emulator (e.g. HyperTerminal)
 - Telnet
- SNMP

The SatLink VSAT web interface is used as the main interface for initial configuration of the VSAT parameters and is presented in section 6. The status monitoring of the VSAT using a web interface is presented in section 7. Configuration via CLI is presented in section 9 and management via SNMP is presented in Appendix E. The Web interface can be used for most common configuration tasks, while advanced configuration is only available via SNMP and CLI.



1.3 Symbols



NOTE

Additional information that the reader should pay special attention to.



WARNING

System malfunction may occur if the warning information is violated.



2. Unpacking

Check that the following items are in the box received and then unpack.

- SatLink 1000, 1910, 2000, or 2900
- Stand for vertical placement (SatLink 1000 only)
- AC adapter (SatLink 1000/2000 only)
- Power cord
- Brackets for 19” rack mounting (SatLink 1910 and SatLink 2900 only)



3. Installation

3.1 Before Installation

3.1.1 Safety



Follow these guidelines to ensure general safety:

- Always comply with national and local electrical codes.
- Keep the installation area clear and dust free during and after installation.
- Keep tools and all components away from walking areas.
- Do not wear loose clothing, jewelry (including rings and chains), or other items that might get caught on the IDU, the ODU, or the interconnecting cables.
- Do not work on the system or connect or disconnect cables during lightning storms.

Follow these guidelines when working with electrical equipment:

- Disconnect all power and external cables before installing or removing a SatLink VSAT IDU.
- Do not work alone when potentially hazardous conditions exist.
- Never assume that power has been disconnected from a circuit; always check.
- Do not act in any way that creates a potential hazard to people or makes the equipment unsafe.
- Never install equipment that appears damaged.
- Carefully examine your work area for possible hazards such as moist floors, unearthed power extension cables and missing protective earths.

Should an electrical accident occur:

- Be cautious – do not become a victim yourself
- Turn off electrical power to the system.
- If possible, send another person to get medical aid. Otherwise, assess the condition of the victim and then call for help.
- Determine if the victim needs artificial respiration or external cardiac compressions; then take appropriate action.

3.1.2 Site Requirements

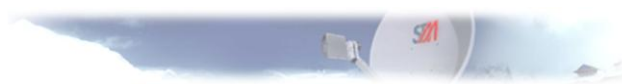
The VSAT IDU should be connected to 110/240 VAC, 50-60Hz power.

3.2 SatLink VSAT IDU Front and Rear Panels

3.2.1 SatLink 2000 Front and Rear Panel



Figure 3 : SatLink 2000 Front Panel



LED		Color: indicates
Power		Yellow: lights steadily when connected to the power supply and unit is powered. Flashes when loading software.
Error		Red: lights steadily when an error event occurs and during reboot.
Satellite	Receive	White: flashes when the receiver is searching for the carrier. Lights steadily when receiver is on and functioning properly. Flashes when IP packets are received from the Satellite Interface (the Hub).
	Transmit	White: flashes rapidly when a continuous wave (CW) is transmitted. Lights steadily when the VSAT is logged on to the DVB-RCS Hub. Flashes when IP packets are transmitted to the Satellite Interface (the Hub).
Ethernet	Link/Act	White: lights steadily when Ethernet connectivity is OK. Flashes slowly when Ethernet packets are transferred via the Ethernet interface.
Status		For future use

Table 1: SatLink 2000 Front Panel LEDs



Figure 4 : SatLink 2000 Rear Panel

Item	Description
Power Connector	Connector for cable to the 24 V DC power transformer (external power supply provided with STM SatLink 2000 VSAT)
Ethernet Connector	RJ45 connector for IP traffic to connect to a PC, Ethernet switch, IP router etc. 10BASE-T or 100BASE-T modes is detected automatically.
COM1 Connector	Nine pin connector for connecting CLI interface to a computer's DB-9 serial interface.
RX coaxial jack	Coaxial 75 Ω F-type jack for the cable to the LNB.
TX coaxial jack	Coaxial 75 Ω F-type jack for the cable to the BUC.

Table 2: SatLink 2000 Rear Panel Description

3.2.2 SatLink 1000 Front and Rear Panel



Figure 5: SatLink 1000 Front Panel



LED		Color: indicates
Power		White: lights steadily when power switch is on and unit has power. Flashes when loading software.
Error		Red: lights steadily when an error event occurs and during reboot.
Satellite	Receive	White: flashes when the receiver is searching for the carrier. Lights steadily when receiver is on and functioning properly. Flashes when IP packets are received from the Satellite Interface (the Hub).
	Transmit	White: flashes rapidly when a continuous wave (CW) is transmitted. Lights steadily when the VSAT is logged on to the DVB-RCS Hub. Flashes when IP packets are transmitted to the Satellite Interface (the Hub).
Ethernet	Link/Act	White: lights steadily when Ethernet connectivity is OK. Flashes slowly when Ethernet packets are transferred via the Ethernet interface.

Table 3: SatLink 1000 Front Panel LEDs



Figure 6: SatLink 1000 Rear Panel

Item	Description
On/off switch	Power on (1) or off (0).
Power Connector	Connector for cable to the 24 V DC power transformer (external power supply provided with SatLink 1000 VSAT)
Ethernet Connector	RJ45 connector for IP traffic to connect to a PC, Ethernet switch, IP router, etc. 10BASE-T or 100BASE-T modes are detected automatically.
COM1 Connector	Nine pin connector for connecting CLI interface to a computer's DB-9 serial interface.
RX coaxial jack	Coaxial 75 Ω F-type jack for the cable to the LNB.
TX coaxial jack	Coaxial 75 Ω F-type jack for the cable to the BUC.

Table 4: SatLink 1000 Rear Panel Description

3.2.3 SatLink 1910 Front and Rear Panel



Figure 7: SatLink 1910 Front Panel



LED		Color: indicates
Power		White: lights steadily when power switch is on and unit is powered. Flashes when loading software.
Error		Red: lights steadily when an error event occurs and during reboot.
Satellite	Receive	White: flashes when the receiver is searching for the carrier. Lights steadily when receiver is on and functioning properly. Flashes when IP packets are received from the Satellite Interface (the Hub).
	Transmit	White: flashes rapidly when a continuous wave (CW) is transmitted. Lights steadily when the VSAT is logged on to the DVB-RCS Hub. Flashes when IP packets are transmitted to the Satellite Interface (the Hub).
Ethernet	Link/Act	White: lights steadily when Ethernet connectivity is OK. Flashes slowly when Ethernet packets are transferred via the Ethernet interface.

Table 5: SatLink 1910 Front Panel LEDs



Figure 8: SatLink 1910 Rear Panel

Item	Description
On/Off switch	Power on (1) or off (0).
Power Connector	Standard recessed plug for 110-240VAC power cord.
Ethernet Connector	RJ45 connector for IP traffic to connect to a PC, Ethernet switch, IP router, etc. 10BASE-T or 100BASE-T mode is detected automatically.
COM1 Connector	Nine pin connector for connecting CLI interface to a computer's DB-9 serial interface.
Cover for Accessory Card	Not used.
RX coaxial jack	Coaxial 75 Ω F-type jack for the cable to the LNB.
TX coaxial jack	Coaxial 75 Ω F-type jack for the cable to the BUC.

Table 6: Description of SatLink 1910 Rear Panel

3.2.4 SatLink 2900 Front and Rear Panel



Figure 9: SatLink 2900 Front Panel



LED		Color: indicates
Power		White: lights steadily when power switch is on and unit is powered. Flashes when loading software.
Error		Red: lights steadily when an error event occurs and during reboot.
Satellite	Receive	White: flashes when the receiver is searching for the carrier. Lights steadily when receiver is on and functioning properly. Flashes when IP packets are received from the Satellite Interface (the Hub).
	Transmit	White: flashes rapidly when a continuous wave (CW) is transmitted. Lights steadily when the VSAT is logged on to the DVB-RCS Hub. Flashes when IP packets are transmitted to the Satellite Interface (the Hub).
Ethernet	Link/Act	White: lights steadily when Ethernet connectivity is OK. Flashes slowly when Ethernet packets are transferred via the Ethernet interface.

Table 7: SatLink 2900 Front Panel LEDs



Figure 10: SatLink 2900 Rear Panel

Item	Description
On/Off switch	Power on (1) or off (0).
Power Connector	Standard recessed plug for 110-240VAC power cord.
Ethernet Connector 1	RJ45 connector for IP traffic to connect to a PC, Ethernet switch, IP router etc. 10BASE-T, 100BASE-T or 1000BASE-T mode is detected automatically.
Ethernet Connector 2	Not used.
USB Port	Not used.
DC Power Connector	Connector for alternative 24VDC (19-36VDC) power supply. Typically used when powered from solar panels.
COM1 Connector	Nine pin connector for connecting CLI interface to a computer's DB-9 serial interface.
Cover for Accessory Card	Not used.
J1	Digital I/O used for Mobile applications Please refer to section 19.1.2 for more information.
RX coaxial jack	Coaxial 75 Ω F-type jack for the cable to the LNB.
TX coaxial jack	Coaxial 75 Ω F-type jack for the cable to the BUC.

Table 8: SatLink 2900 Rear Panel

3.3 IDU Installation

3.3.1 On Desktop or Shelf

Place the VSAT IDU on a flat, stable surface, such as a desktop or shelf, close to the PC or network device to which it will be connected. Keep its top, bottom, and all sides unobstructed to ensure free airflow. Rubber feet on the bottom provide adequate clearance. Ensure that there is at least 10 cm clearance at the back to allow room for cable connections.



3.3.2 In Rack



The rack or cabinet should be properly secured to prevent tipping. Equipment that is installed in a rack or cabinet should be mounted as low as possible, with the heaviest units lower down, and lighter units toward the top.

Precautions:

- Ensure that the power circuits are properly grounded and use the power cord supplied with the SatLink VSAT IDU to connect it to the power outlet.
- If your installation requires a different power cord than the one supplied, ensure that the cord used is certified as indicated by the stamped or embossed logo of the electrical safety authority in your country.
- If the on/off switch on the back panel is difficult to reach when the unit is fitted in the rack, ensure that the power outlet into which it is plugged can be reached so it may be unplugged if necessary.
- Ensure that the unit does not overload the power circuit, wiring, or over-current protection. To determine the possibility of overloading the supply circuits, add together the amperage ratings of all devices installed on the same circuit as the VSAT IDU and compare the total with the rating limit for the circuit. The maximum amperage ratings are usually printed on units near their power connectors.
- Do not install the VSAT IDU in a location where the operating ambient temperature may exceed 45°C.
- Ensure that the airflow around the sides and back of the SatLink VSAT IDU is not restricted.

The SatLink 1900/1901/1910/2900 can be mounted in any EIA-standard 19-inch telecommunications rack or cabinet. The STM SatLink 1000 and 2000 need to be placed on a shelf if either is to be placed in a rack.

Use a Torx screwdriver and attach the mounting brackets to the router with the screws supplied. Hold the unit securely, brackets attached, and move it vertically until the rack holes line up with the bracket notches, then insert and tighten the four screws holding the brackets to the rack.

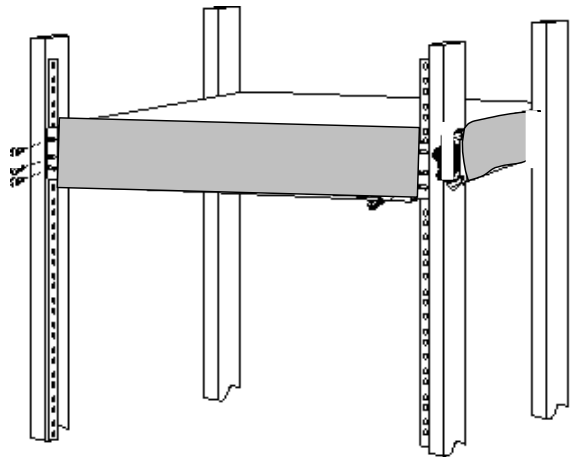


Figure 11: Rack Mounting

3.4 ODU Installation

Install the ODU as described in Appendix F, reference [1] and the antenna installation manual. When installing the SatLink 403x transceiver, please check Table 22 in Appendix G to determine whether an adapter is required to interface the antenna feed horn.



3.5 Interface Connections

3.5.1 RX/TX cables between IDU and ODU

The coaxial cables from the ODU are connected to the type F coaxial jacks on the back panel of the VSAT IDU.

- Connect one coaxial cable from the ODU TX module input to the jack marked TX.
- Connect one coaxial cable from the LNB to the port marked RX on the back panel.



Use only 75 Ω coaxial cables fitted with type F plugs for the RX and TX cables. Make sure that the connectors are waterproof, such as the F-connector RG6 Compression type from Cablecon (www.cablecon.dk), article no. 99909446



ODU TX and RX connectors must always be protected with vulcanizing tape after the coaxial cables to the BUC and LNB are connected as shown in Figure 12.

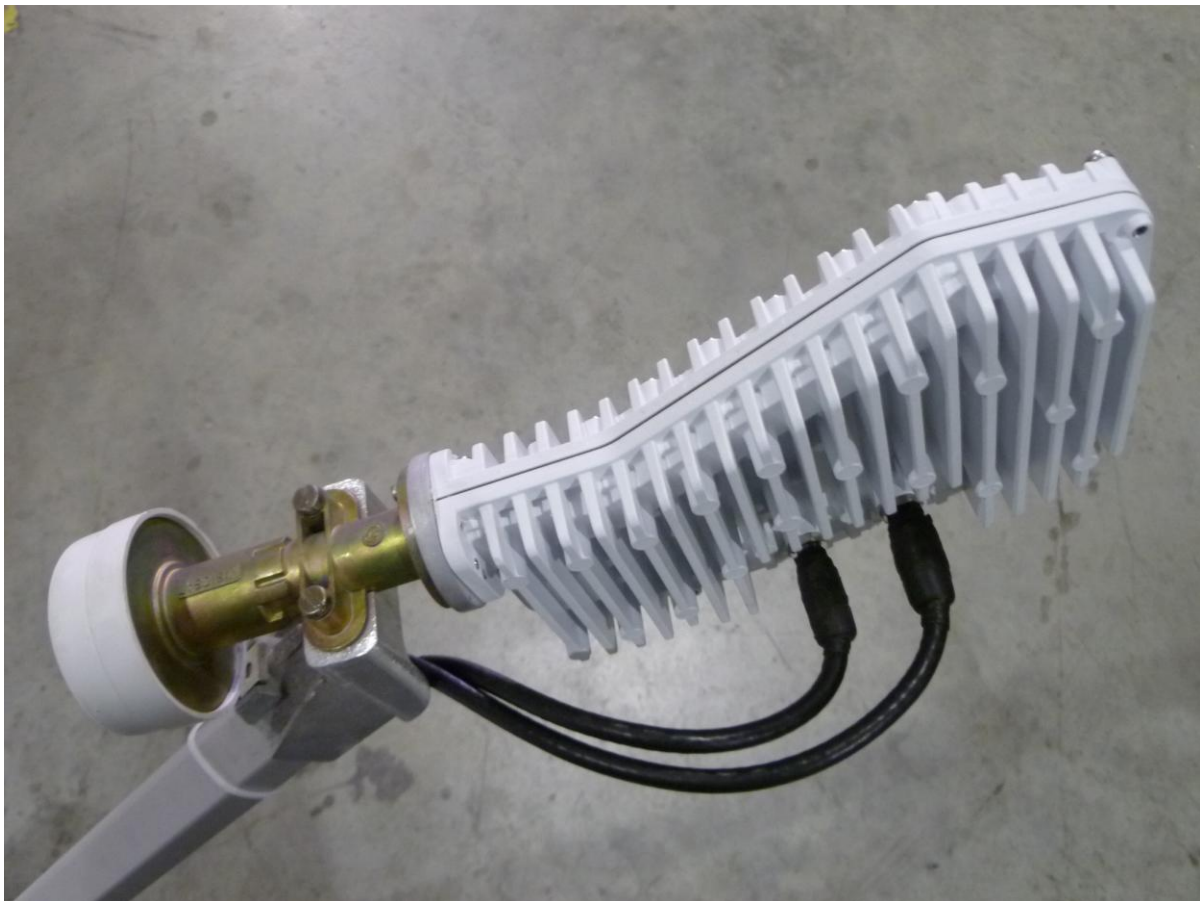


Figure 12 : TX and RX Connectors with Vulcanizing Tape



Do not connect and disconnect the coaxial cables with power connected to the VSAT IDU.

Hint

Use different color marking on the TX and RX coaxial cables to eliminate likelihood of interchanging the RX and TX coaxial cables.



3.5.2 Ethernet connection to a Local Area Network (LAN)

The VSAT IDU may be connected to a single PC or to a network via the RJ-45 Ethernet jack on the back panel.

- Plug one end of the Ethernet cable into the RJ-45 jack on the back panel.
- Plug the other end of the Ethernet cable into the RJ-45 jack a Local Area Network (LAN) device, such as an Ethernet hub, switch, or router, according to its manufacturer's instructions.

The SatLink VSAT will auto-detect if Ethernet HUB or NODE mode is used and will automatically chose the correct mode; hence there is no need to use a cross-over Ethernet cable for direct connections to PCs.

3.5.3 Power Connection

The SatLink 1910 and 2900 models have internal power supply and consequently are connected directly to a 110/230 VAC 50/60Hz outlet using a standard 230 VAC power cord.

3.5.4 Power supply

The SatLink 1000 and 2000 have an external power supply that is connected to a 110/240 VAC 50/60Hz outlet using a standard power cord.



The SatLink 1000 and 2000 must only be connected to the external power supply that is approved by STM, PN 104170 (LEI-S2425D/Adapter Technology, Model No. STD-2425). Use of another power supply will void warranty.



4. Connecting a PC to the SatLink VSAT

After installation as described in Chapter 3 is carried out, the VSAT IDU is ready to be powered on.

4.1 Windows 7 TCP/IP Configuration

Verify that the TCP/IP configuration is correct for PCs connected to the LAN that are to be used for your SatLink VSAT. Click on the Start button in Windows 7, select Control Panel, and then click Network and Sharing Center. Click Change Adapter Settings and right-click on the relevant Local Area Connection and select Properties. A new window showing the Network Connection Properties will pop up. In the Networking submenu of this window, scroll down, select Internet Protocol Version 4 (TCP/IPv4) and then click the Properties button shown in Figure 13. Then configure the PC client to obtain the IP address automatically from the VSAT IDU (section 4.1.1) or configure the PC with a static IP address (section 4.1.2).

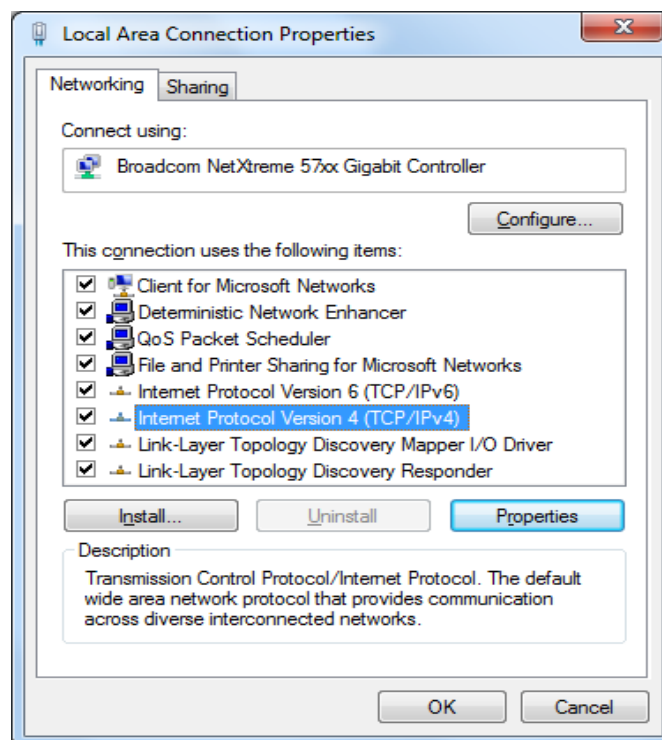


Figure 13: Windows 7 Menu for Configuring the Client TCP/IP Configuration

4.1.1 Dynamic IP Configuration of PCs Connected to the VSAT LAN

By default, the DHCP server in the SatLink VSAT is enabled, and when the VSAT is powered on, all PCs connected to the VSAT LAN can automatically retrieve their IP configuration from the DHCP server. The user should verify that the Windows clients are configured to obtain an IP address and DNS server address automatically. Figure 14 shows the correct Windows 7 configuration when the DHCP server is enabled in the VSAT.

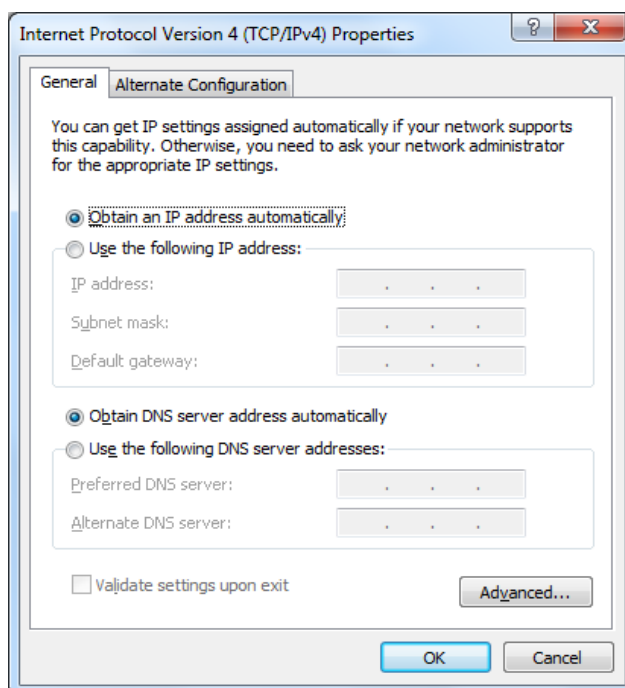


Figure 14: Windows 7 TCP/IP Setting when DHCP Server is Enabled in the VSAT

From an MS-DOS window, the user may type *ipconfig /all* command to verify that the computer has received correct configuration parameters from the DHCP server, such as IP address, subnet mask, default Gateway, DNS servers, and lease time.

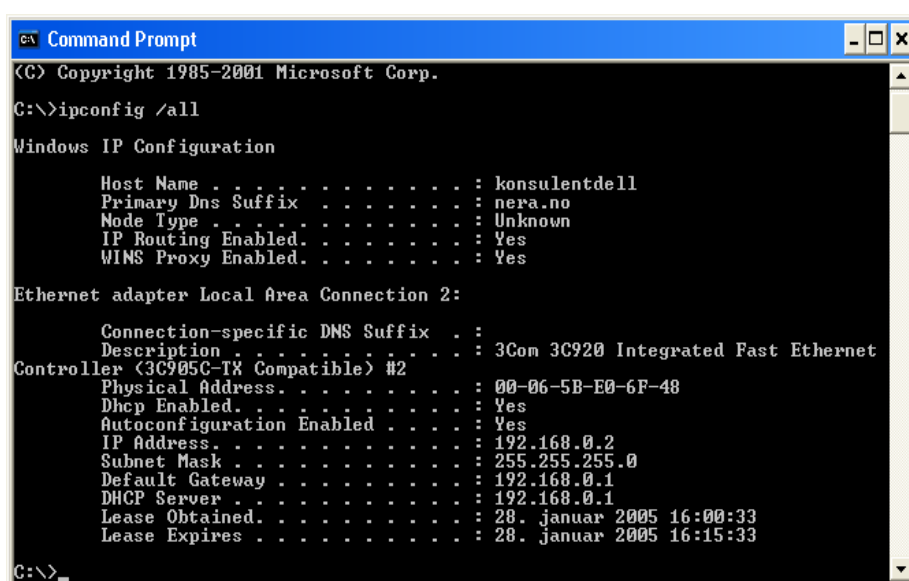
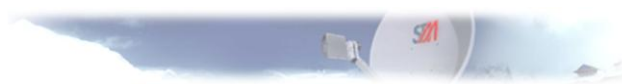


Figure 15: *ipconfig /all* Printout from an MS-DOS Window



4.1.2 Static IP Configuration of PCs Connected to the VSAT LAN

When the DHCP server in the SatLink VSAT is disabled, all PCs attached to the VSAT LAN must be configured with static IP addresses that are within the address range of the VSAT subnet. The IP configuration parameters to use for PCs connected to the VSAT LAN are supplied from the system operator or service provider. Configure the IP address, Subnet mask, Default gateway, Preferred DNS server, and, optionally, the Alternate DNS server as shown in Figure 16.



Ensure that the actual IP addresses supplied by the system operator/service provider are configured and not the IP addresses in the example figure.

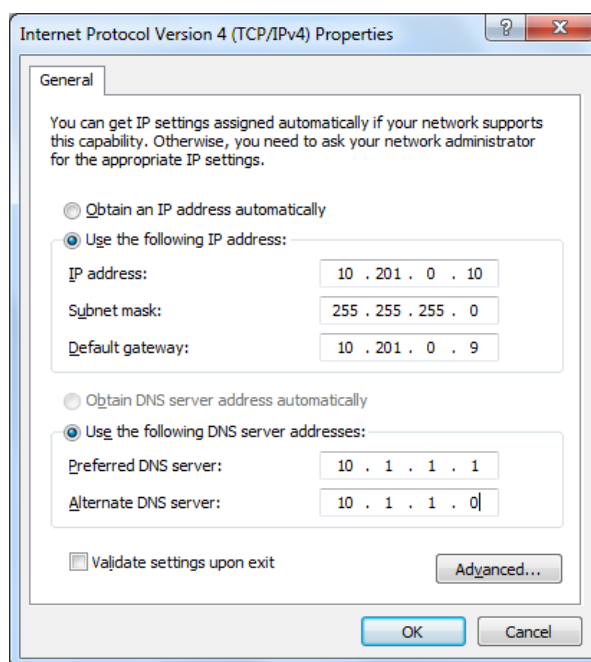


Figure 16: Windows 7 TCP/IP Setting when DHCP Server is Disabled in the VSAT

Example:

A host may have the following configuration: IP address 10.201.0.10, Subnet mask 255.255.255.0 and default gateway 102.201.0.9, where the IP address of the default gateway should be the IP address of the VSAT LAN interface.

4.2 Windows XP TCP/IP Configuration

Verify that the TCP/IP configuration is correct for PCs connected to the LAN you plan to use for your SatLink VSAT. Click on the Start button in Windows, click Control Panel and then open Network Connections. Right-click on the relevant Local Area Connection and select Properties. A new window showing the Network Connection Properties will pop up. In the General submenu of this window, scroll down, select Internet Protocol (TCP/IP) and then click the Properties button shown in Figure 17. Then configure the PC client to obtain the IP address automatically from the VSAT IDU (section 4.1.1) or configure the PC with a static IP address (section 4.1.2).

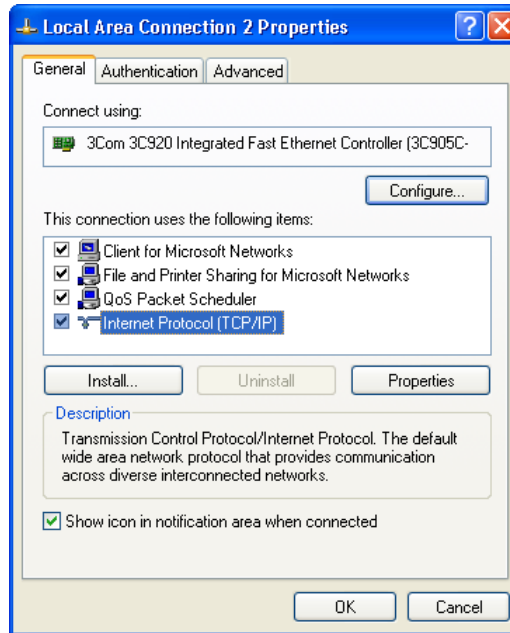


Figure 17: Windows XP Menu for Configuring the Client TCP/IP Configuration.

Note: The procedure for Dynamic and Static IP configuration of PCs connected to the VSAT LAN using Windows XP are the same as described in section 4.1.1 and section 4.1.2, respectively.



5. Using the SatLink VSAT Web Interface

The SatLink VSAT Web interface supports managing the most common configuration parameters and viewing the status of the VSAT. The web browser currently supported is Microsoft Internet Explorer, but other browsers, like Firefox and Opera, typically work fine as well. The functions available via the web interface are:

- Configuring the most commonly used satellite interface parameters
- Configuring the most commonly used IP parameters
- Return Link line-up procedure
- Viewing status information for the satellite interface
- Viewing traffic statistics
- Viewing device information
- Viewing status of the DHCP server
- Viewing Event log information

Advanced functions, such as adding SW licenses, configuring GRE tunnels, downloading software updates manually, configuring automatic software updates, configuring system information, adding users and changing a user's password, configuring SNMP access, adding manual IP routes, etc., are only available from the CLI via Telnet or the RS-232 port.

To manage the SatLink VSAT via the web interface, start the web browser and type in the IP address of the VSAT in the address field as shown in Figure 18. The factory default IP address of the SatLink VSAT is 192.168.0.1. Use the VSAT's Satellite Interface (DVB) IP address when connecting to the VSAT over the satellite link (from the Hub), and the VSAT's LAN (Ethernet) IP address when connecting to the VSAT from the local LAN. Then enter the username and password to log on to the VSAT.

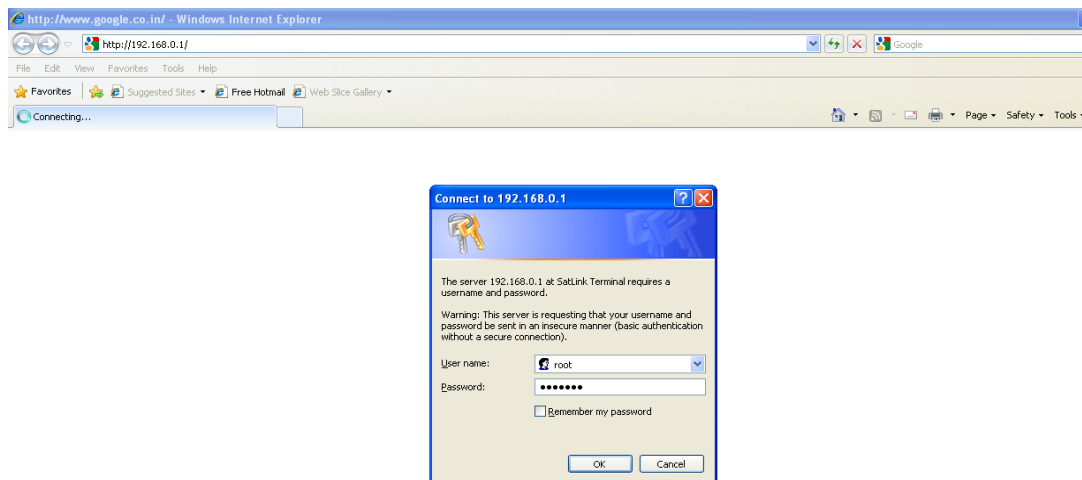


Figure 18: Connecting to the Web Interface



6. SatLink VSAT Configuration and Line-up Using the Web Interface

Follow all the procedures mentioned below when installing the SatLink VSAT and lining up the ODU using the Web interface. Please see section 7 for SatLink VSAT status monitoring using the web interface.

6.1 Log On to the VSAT Web Interface

- 1) Start the web browser and type in the IP address of the VSAT in the address field.
- 2) Login with username `install` and factory default password `dvbrcs`. Click the OK button.

Username: `install`

Password: `dvbrcs`

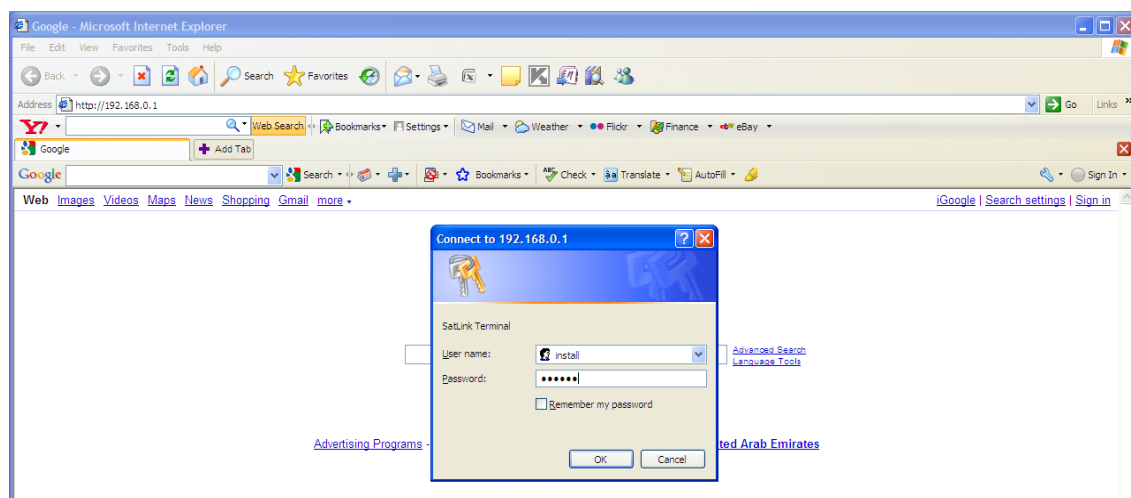


Figure 19: Log on Page

6.2 Configuring VSAT Parameters Required to Log on to the Hub

The SatLink VSAT Web interface is used to configure a number of parameters before the VSAT can acquire the Forward Link and communicate with the Hub via the satellite connection. A default configuration specifying most of these parameters is pre-loaded on each VSAT, either in the factory or by the service provider before installation. The following configuration parameters are typically to be configured using the VSAT Web interface:

- DVB-S2 Reception parameters
- VSAT GPS Position

Other parameters are typically configured automatically from the Hub when the VSAT logs on for the first time. When ODUs other than the SatLink 403x transceiver are used or if the Hub operator does not use automatic VSAT configuration, then additional VSAT parameters might have to be configured during installation.

6.2.1 Receiver Parameter Configuration

The VSAT is normally pre-configured to be used together with the SatLink 403x transceiver. But it is possible to configure the VSAT to operate together with transceivers other than the SatLink 403x. The list of LNBs that can be used with the VSAT are listed in Table 11

- 1) Click on the *Configuration* → *Satellite* option in the SatLink VSAT home page.

SatLink VSAT - Windows Internet Explorer

http://192.168.0.1/wmi/dwp/index

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SatLink VSAT

STM SatLink VSAT

Status

- Satellite
- Statistics
- Device
- DHCP
- Mesh
- Eventlog

Configuration

- Satellite
- IP
- NAT
- Lineup

Help

- Introduction
- Status
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- Logout

Receiver

Auto Start: LNB Type:

Forward Link Table

	SymbolRate [Mps]	Frequency [GHz]	Mode	PopId	Enable
Primary	30.000000	12.500000	DVB-S2	2	<input checked="" type="checkbox"/>
Secondary	20.000000	1.300000	DVB-S2	4	<input checked="" type="checkbox"/>

VSAT Position

Latitude: deg min sec

Longitude: deg min sec

Altitude: m

You are logged in as root (1)

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Figure 20: Configuring Receiver Parameters for Fixed VSAT



2) Configure the Receiver parameters as shown in the following table:

Parameter	Description
Auto Start	<ul style="list-style-type: none"> • On • Off <p>Specific for the receiver. When set to "On" the VSAT will automatically acquire the Forward Link. It is recommended to always set this to "On" for normal operation. Please always restart the VSAT after saving configuration when having set auto start to "On".</p>
LNB Type	Specifies the LNB type with which the VSAT is configured.
Entry	<p>The web interface allows the configuration of two Forward Link entries for fixed VSATs:</p> <ul style="list-style-type: none"> • Primary: corresponds to "Index 0" of CLI configuration • Secondary: corresponds to "Index 1" of CLI configuration <p>The primary entry has higher priority than the secondary entry so the Forward Link search will start with the primary entry.</p> <p>If the VSAT has a "Mobile" license the web interface allows the configuration of up to 10 Forward Link entries with up to 10 different priorities [0 – 9].</p>
Symbol Rate (Mps)	The Forward Link symbol rate in Mps.
Frequency (GHz)	Forward Link frequency [kHz].
Mode	<p>Enter the valid modes:</p> <ul style="list-style-type: none"> • DVB-S • DVB-S2
PopId	Population ID to use for Forward Link acquisition. The VSAT will select which group in the DVB-RCS system it belongs to based on the configured population ID. The population ID to be used is assigned by the Hub Operator.
Enable	Enable the table entry.

- 3) Click the *Save* button to save the configuration.
- 4) Click *Start* button to start the receiver manually (Only required with Autostart mode “off”).

6.2.2 Transmitter Parameter Configuration

The VSAT is normally pre-configured to be used together with the SatLink 403x transceiver. But it is possible to configure the VSAT to operate together with transmitters other than the SatLink 403x. The valid ODU transmitters (BUC) used with the VSAT are listed in Table 9.

- 1) Click on the *Configuration* → *Satellite* option in the SatLink VSAT home page.

The screenshot shows the SatLink VSAT web interface in a Windows Internet Explorer browser. The address bar shows the URL <http://192.168.0.1/wmi/dwp/index>. The page has a sidebar menu on the left with options: Status, Satellite, Statistics, Device, DHCP, Mesh, Eventlog, Configuration, Satellite, IP, NAT, Lineup, Help, Introduction, Status, Configuration, and Logout. The main content area is titled 'SatLink VSAT' and contains two main sections: 'Transmitter' and 'Receiver'.

Transmitter Configuration:

- Auto Start: (dropdown)
- Timeout: min
- EIRP: dBW
- IDU OutPow: dBm
- BUC: (dropdown)
- Antenna: (dropdown)
-

Receiver Configuration:

- Auto Start: (dropdown)
- LNB Type: (dropdown)
-

Forward Link Table:

	SymbolRate [Msps]	Frequency [GHz]	Mode	PopId	Enable
Primary	<input type="text" value="30.000000"/>	<input type="text" value="12.500000"/>	<input type="text" value="DVB-S2"/> (dropdown)	<input type="text" value="2"/>	<input checked="" type="checkbox"/>
Secondary	<input type="text" value="20.000000"/>	<input type="text" value="1.300000"/>	<input type="text" value="DVB-S2"/> (dropdown)	<input type="text" value="4"/>	<input checked="" type="checkbox"/>

At the bottom of the page, it says 'You are logged in as root (1)' and '© Copyright 2006-2011 STM Group. All Rights Reserved.'

Figure 21: Configuring Transmitter Parameters



2) Configure the Transmitter parameters as shown in the following table.

Parameter	Description
Auto Start	<ul style="list-style-type: none"> • ON • Off • Traffic <p>Specific for the transmitter. When set to "traffic", the VSAT will log on to the Hub when it has traffic to send. After a configurable time (given by Timeout) without any traffic to send, the VSAT will automatically log off.</p>
EIRP (dBW)	Specifies the emitted power level. Only used for a SatLink 403x ODU and not relevant for a 3rd party BUC.
Timeout (min)	Idle time before the VSAT automatically logs off when the Autostart mode is set to "traffic".
IDU OutPow (dBm)	Only used for 3rd party BUCs, as the IDU output power is set automatically when using a SatLink 403x ODU.
BUC	Specifies the BUC type or transceiver type with which the VSAT is equipped. The valid ODU transmitters (BUCs) are listed in Table 9.
Antenna	Specifies the antenna type with which the VSAT is equipped. The correct antenna type is required to correctly compute EIRP used for the automatic power calibration of the SatLink 403x transceiver. The valid ODU receivers (LNB) are listed in Table 11.



If the ODU transmitter type or LNB type has been changed, the VSAT must be restarted to activate the new configuration (press the Restart button after saving the configuration).

3) Click the *Save* button to save the configuration.

4) Click *Start* button to start the transmitter manually (only required with Autostart mode "off").

6.2.3 VSAT Positioning

The Operator must specify the geographical position of the VSAT to enable the VSAT to log on to the network. In order to calculate the delay to the satellite correctly for the logon burst, the VSAT must be configured with its own geographical position. Find the position of the location where installing the VSAT using a standard GPS.

The VSAT position is entered in the below format:

- degrees, minutes, seconds, and direction



- 1) Click on the *Configuration* → *Satellite* option in the SatLink VSAT home page.

Figure 22: VSAT Positioning

- 2) Configure the VSAT positioning parameters as shown in the following table.

Parameter	Description
Latitude	Enter the latitude (deg, min, sec and direction).
Longitude	Enter the longitude (deg, min, sec and direction)
Altitude	Enter the altitude (meters)

- 3) Click the *Save* button to save the configuration.

6.2.4 IP Address Configuration

- 1) The VSAT web interface is used to configure the IP addresses and netmasks of the VSAT's LAN, Management and Virtual (Vir1-eth0) interfaces. The Web interface is also used for LAN DHCP server, DNS, NAT, and PEP configuration.

Click on the *Configuration* → *IP* option in the SatLink VSAT home page.

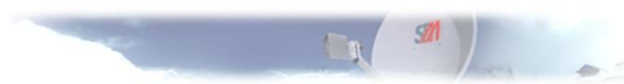
The screenshot shows the SatLink VSAT web interface in a Windows Internet Explorer browser. The address bar shows the URL http://192.168.252.5/wmi/dwp/index_page.dwp. The page title is "SatLink VSAT". The left sidebar contains a navigation menu with the following items: Status, Satellite, Statistics, Device, DHCP, Eventlog, Configuration, Satellite, IP, NAT, Lineup, Help, Introduction, Status, Configuration, and Logout. The main content area is titled "IP Configuration" and contains a table with the following data:

Interface	IP Address	Net Mask	DHCP Enable
LAN	192.168.32.21	255.255.255.252	<input checked="" type="checkbox"/>
Management	192.168.252.5	255.255.255.255	<input type="checkbox"/>
Vir1-eth0	101.101.101.101	255.255.255.252	<input type="checkbox"/>

Below the table, there are buttons for "Add Interface" and "Del Interface". The "DHCP Configuration" section includes fields for "Lease Time" (set to 1) and "No. of IP addr. excluded" (set to 0). The "DNS Configuration" section includes fields for "Primary DNS Server" (set to 8.8.8.8) and "Secondary DNS Server" (set to 8.8.4.4). The "NAT Configuration" section includes a dropdown for "Network Address Port Translation (NAPT)" (set to Disable) and a field for "NAT Global Address". The "PEP Configuration" section includes a dropdown for "PEP TCP" (set to Disable). At the bottom of the page, there is a status bar that says "You are logged in as root (1)" and a copyright notice: "© Copyright 2006-2011 STM Group. All Rights Reserved."

Figure 23: IP Configuration – LAN, Management, and Virtual Interfaces

- 2) Enter the valid IP address and Netmask for the LAN, Management, and Virtual (Vir1-eth0) interfaces.
- 3) Enable / Disable the DHCP server.
The DHCP server can be enabled only for one interface (LAN or Virtual).
When enabled, the DHCP server will automatically allocate IP addresses in the VSAT LAN (or Virtual) Interface subnet except the VSAT's own IP LAN (or Virtual) address and addresses excluded manually.
- 4) Set the lease time for an IP address allocated to a host on the LAN (or Virtual) subnet.
- 5) Specify the number of IP addresses to be excluded from the available range of addresses defined by the VSAT LAN (or Virtual) subnet. The excluded range of IP addresses will be the upper range of the LAN (or Virtual) subnet.
- 6) Enter the IP address for the primary and secondary DNS servers to be used by the hosts on the VSAT LAN (or Virtual) subnet.



- 7) Enable / Disable NAT (dynamic NAPT) for the VSAT.
When enabled, enter the NAT Global Address.
- 8) Enable / Disable the TCP and HTTP acceleration.
- 9) Click the *Save* button to save the configuration.

6.3 NAT Configuration using the Web Interface

Set up the NAT Configuration as shown below.

Figure 24: NAT Configuration

Parameter	Description
Global Address	Enter Global Address
Local Address	Enter Local Address
Global Port	Enter Global Port nr.
Local Port	Enter Local Port nr.
Port Range	Enter wanted Port Range.

6.4 Line-up Using the Web Interface

Perform antenna and ODU installation and alignment as described in Appendix F and the initial parameter configuration described in section 6.2 before proceeding with the line-up procedures described here.

6.4.1 Antenna Line-up

Set the alignment of the antenna to optimize the receive SNR. The RX SNR displayed in the graph on the line-up page should appear as a green bar to ensure a stable reception of the Forward Link signal. If the bar is yellow, the signal can be received correctly with low link margin and if the bar is red, the signal

level is too low for error free reception. The RX SNR displayed in the graph on the line-up page appears as a green bar when the RX SNR value is greater than 7.5 dB, yellow if the RX SNR value is 6 - 7.5 dB, and red if the RX SNR value is 0-6 dB.

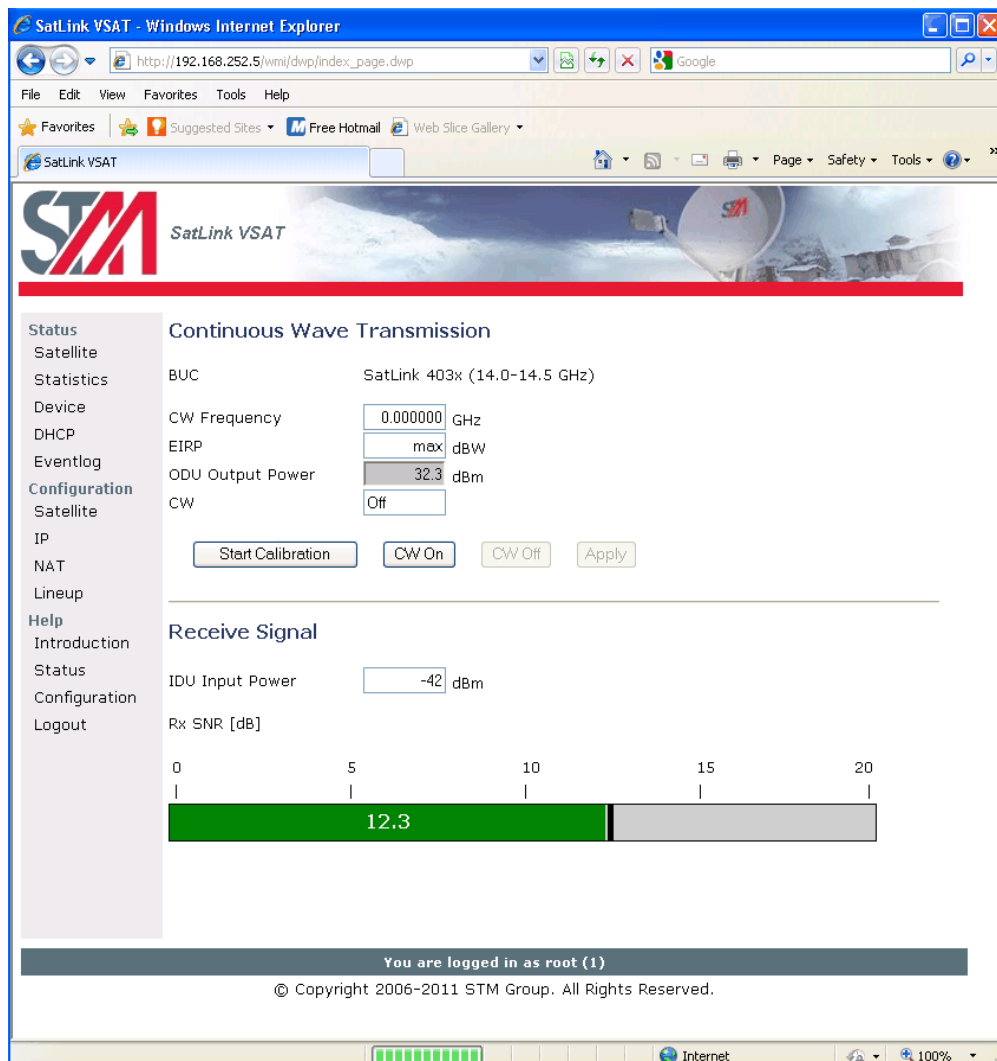


Figure 25: RX SNR Graph

Please see section 9.3 for details of which SNR values are required for different Forward Link configurations.

6.4.2 TX Power Calibration

This section describes how to calibrate the TX output power when using the SatLink 4033/4035 transceiver. See Appendix I for a description of how to perform TX power calibration for other transmitters (BUCs).



TX power level calibration and Return Link acquisition shall only be performed if the Forward Link has been acquired and is operating properly.

1. Ensure that the VSAT configuration procedure in section 6.2 has been performed.
2. Ensure that the VSAT receiver is started and the Forward Link is acquired.
3. Ensure that the VSAT transmitter is turned off and the TX cable from the VSAT to the ODU is connected.
4. Click the *Lineup* option in VSAT home page and configure the transmit EIRP level of the VSAT.

The VSAT can either be configured to transmit at maximum level or alternatively the desired EIRP level can be set to a given level for use in a system where the power level received at the satellite is aligned for all VSATs.

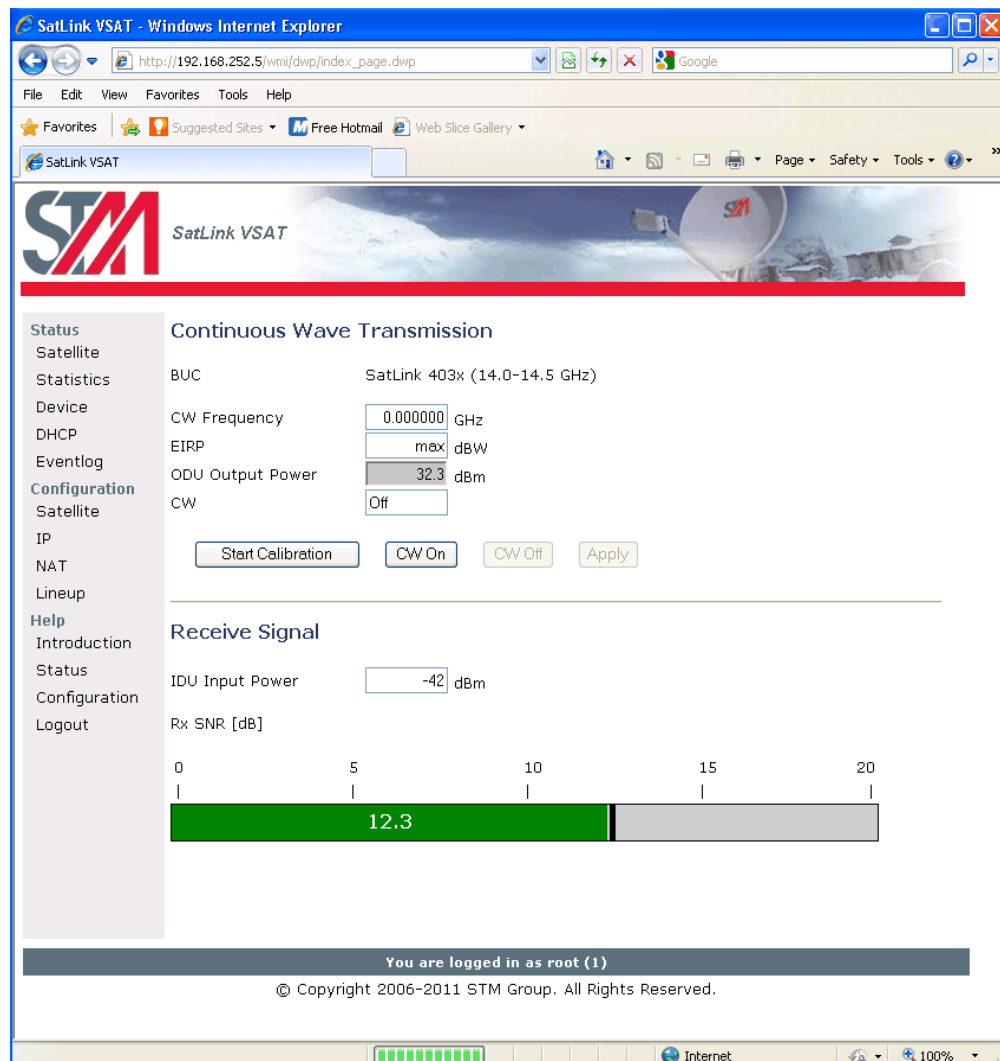


Figure 26: TX Power Calibration

5. The CW frequency to be used for measurements during the calibration procedure is obtained from the service provider or satellite operator.
6. Contact the satellite operator / control center to clarify the line-up procedures for transmission power calibration and fine adjustment and verification of polarization of the VSAT.
7. Push the *Start Calibration* button on the Line-up page to start automatic transmitter power calibration. During this calibration, the transmit EIRP level is detected and the IDU output level is automatically adjusted to the level required for transmitting with the configured EIRP level. Hence, no manual configuration of the IDU output power level or cable attenuation is required.

6.4.3 3rd Party BUC Line-up

When using 3rd party BUCs (i.e., other than the SatLink 403x transceiver), the IDU output power has to be manually adjusted during line-up by use of feedback from the system operator. Beware of the risk of setting the IDU output level too high as a consequence of the antenna pointing not being sufficiently accurate.

1. Log on to the VSAT Web interface and click *Lineup* option in VSAT home page.
2. Ensure that the initial IDU output power level is set to a low value (-30 dBm is recommended).

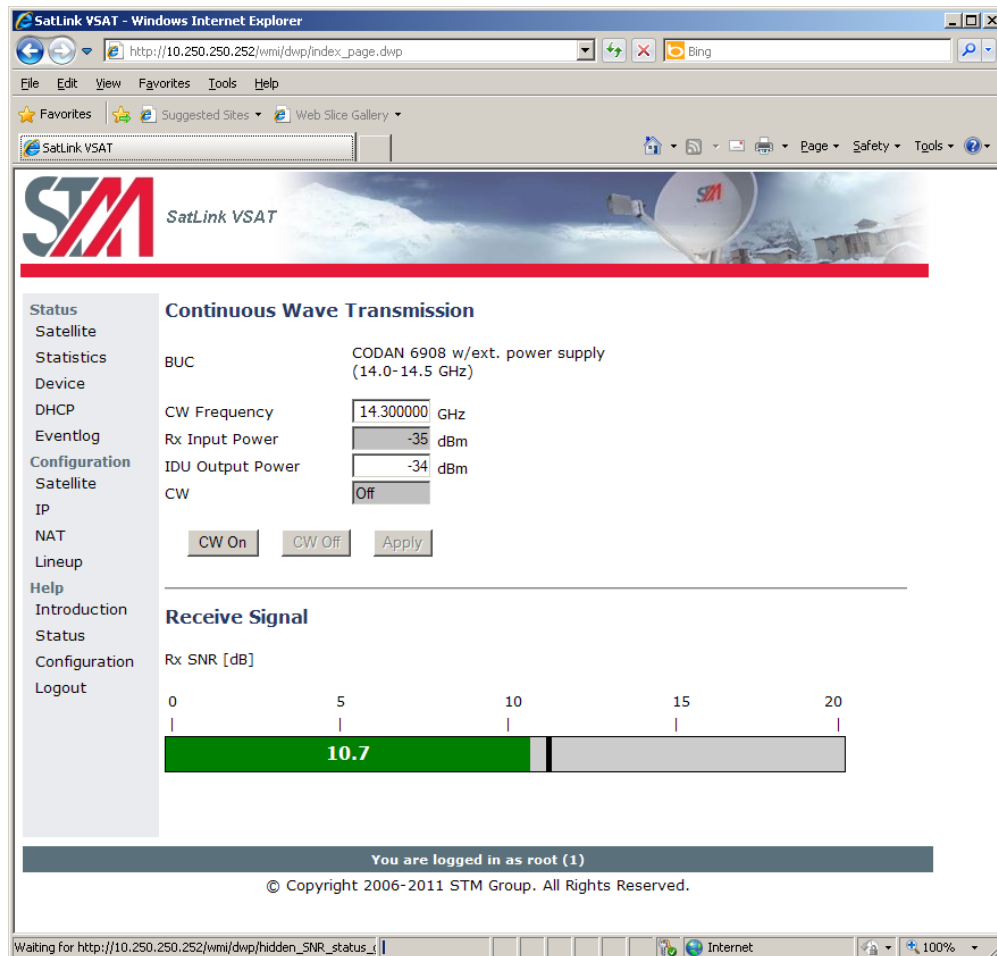


Figure 27: CW Transmission

3. Click the *CW On* button on the Line-up page to initiate the CW transmission. Start the CW transmission only after the permission is granted by the system operator.
4. Adjust the IDU output power in small steps (never more than 5 dB) based on feedback from the system operator.



6.4.4 Fine Adjustment of Antenna Pointing and Polarization

After the initial IDU output power level has been found, the pointing and polarization of the antenna should be finely adjusted based on feedback from the system operator.

1. Fine-tune the pointing and polarization of the antenna based on the feedback from the system operator.
2. After the fine adjustment of the antenna, the received signal level should again be verified by consulting the system operator and the IDU output power level should be adjusted as necessary.
3. Click the *Save* button on the satellite configuration page to save the configuration.

6.5 Test of Connection to Hub

After the line-up procedure in section 9.3 (or alternatively, Appendix I.1) has been successfully completed, the VSAT is ready to log on to the Hub.

The VSAT is only allowed to log on to the network if its DVB MAC address is registered at the Hub. Registration of the VSAT's MAC address at the Hub is a network operator's responsibility. The DVB MAC address of the VSAT can be found under the **Device** option on the SatLink web interface home page or it can be found on the label underneath the VSAT chassis. The MAC address is also shown on the CLI message displayed during the boot procedure of the VSAT.

Example:

```
# device show

System Information:
Name                : SatLink 2000
Location             : UAE
Contact              : STM UAE
System Up time       : 0 days, 00:01:18
CPU Load             : 4%
System time (UTC)    : not set, TDT not received
Broadcast Message    : not set

HW:
Model                : SatLink 2000
HW ID                 : 120033
Main board ID        : 120026 R3.3

MAC addresses:
Ethernet (LAN)        : 00:20:0e:10:35:34
Satellite (DVB)       : 00:20:0e:10:35:34
```

Then do the following:

- 1) If the receiver is not already on, Click **Configuration** on the SatLink VSAT home page and start the receiver by clicking on the *Start* button to acquire the Forward Link.

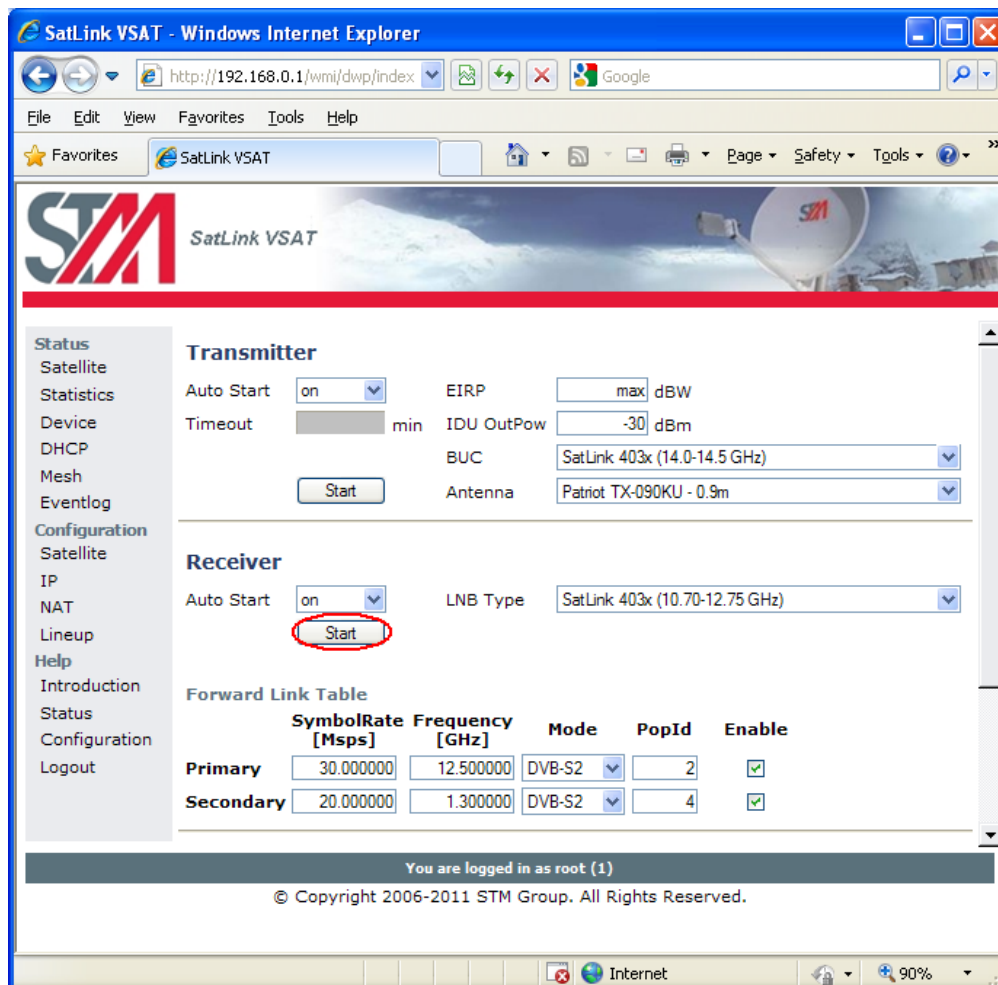


Figure 28: Receiver Configuration

- 2) Start the transmitter by clicking on the *Start* button and log on to the DVB-RCS network.

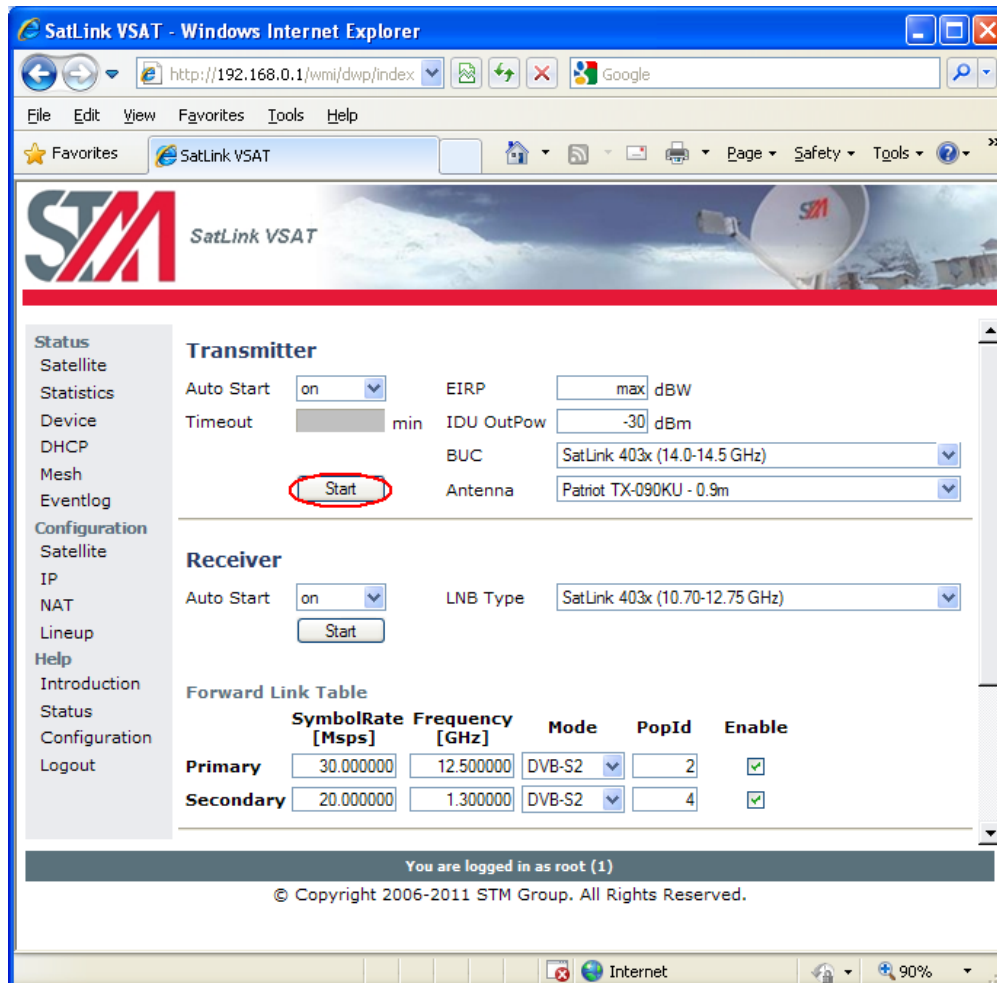


Figure 29: Transmitter Configuration

- 3) Click the *Save* button to save the configuration.
- 4) To test the connection to the Hub, select *Satellite* under the **Status** option on the SatLink web interface home page. This displays the Satellite Interface Status page.
- 5) If the proper connection is established to the Hub, the following status will be displayed on the Satellite Interface Status page:

State : "Two-way link established"
 Transmitter : "On"
 Receiver : "On"

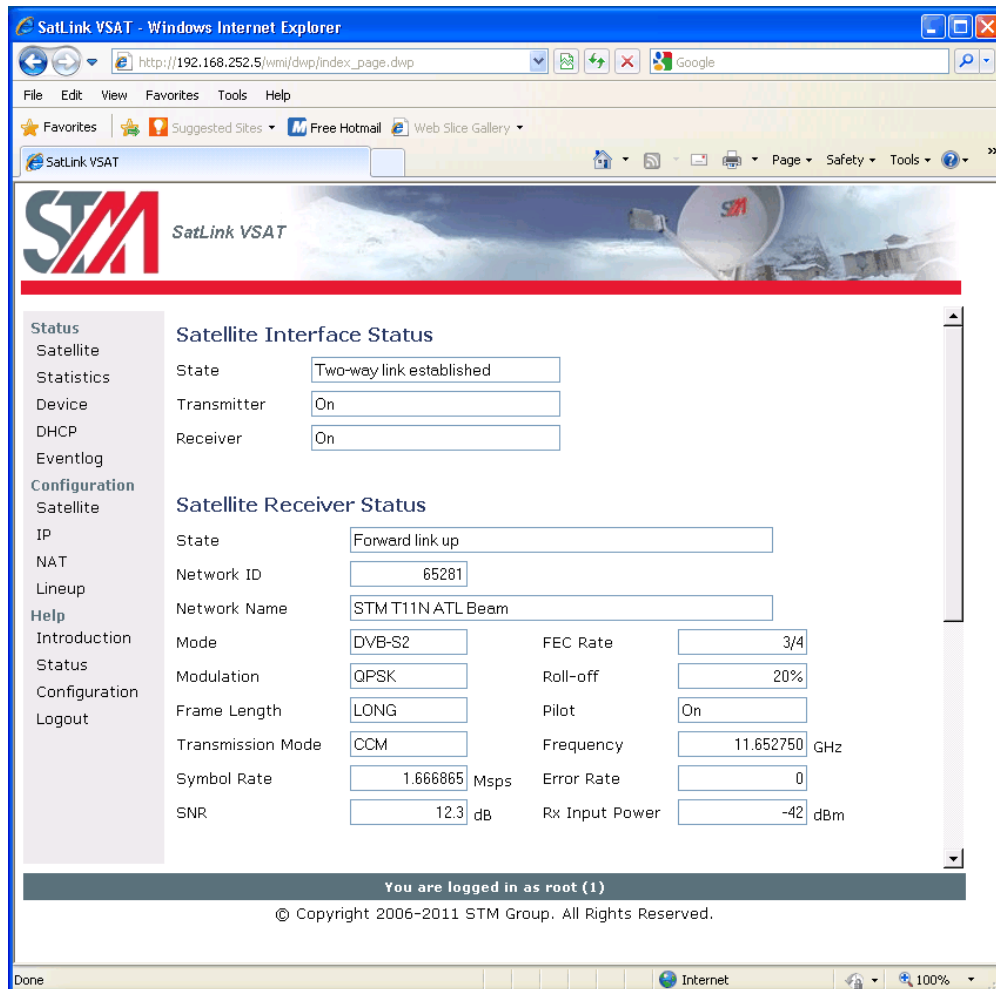


Figure 30: Satellite Interface Status

6.6 Prepare the VSAT for Normal Operation

The connection to the Internet over the satellite network should now be tested and found to be working. The only thing left is then the final configuration to prepare the VSAT for normal operation. The VSAT must be started and a user must be logged in with a minimum privilege level of 2 (e.g., `install user`) before completing the following operations.

- 1) Click on the *Satellite* option under **Configuration** in the SatLink VSAT home page and Configure the VSAT to automatically start the receiver by setting *Auto Start* to “ON”. The VSAT will automatically acquire the Forward Link. Setting the RX auto start to “ON” will ensure that the receiver is started automatically after power failure, link failure, Hub restart, or a software failure, etc., without needing user intervention.

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http://192.168.0.1/wmi/dwp/index

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Receiver

Auto Start LNB Type

Forward Link Table

	SymbolRate [Mps]	Frequency [GHz]	Mode	PopId	Enable
Primary	30.000000	12.500000	DVB-S2	2	<input checked="" type="checkbox"/>
Secondary	20.000000	1.300000	DVB-S2	4	<input checked="" type="checkbox"/>

VSAT Position

Latitude deg min sec

Longitude deg min sec

Altitude m

You are logged in as root (1)

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Figure 31 : Receiver Auto Start

- 2) Configure the VSAT to automatically start the transmitter by setting the *Auto Start* to “ON”. Setting the TX auto start on will ensure that the transmitter is started automatically after power failure, link failure, Hub restart, or a software failure, etc., without needing user intervention.

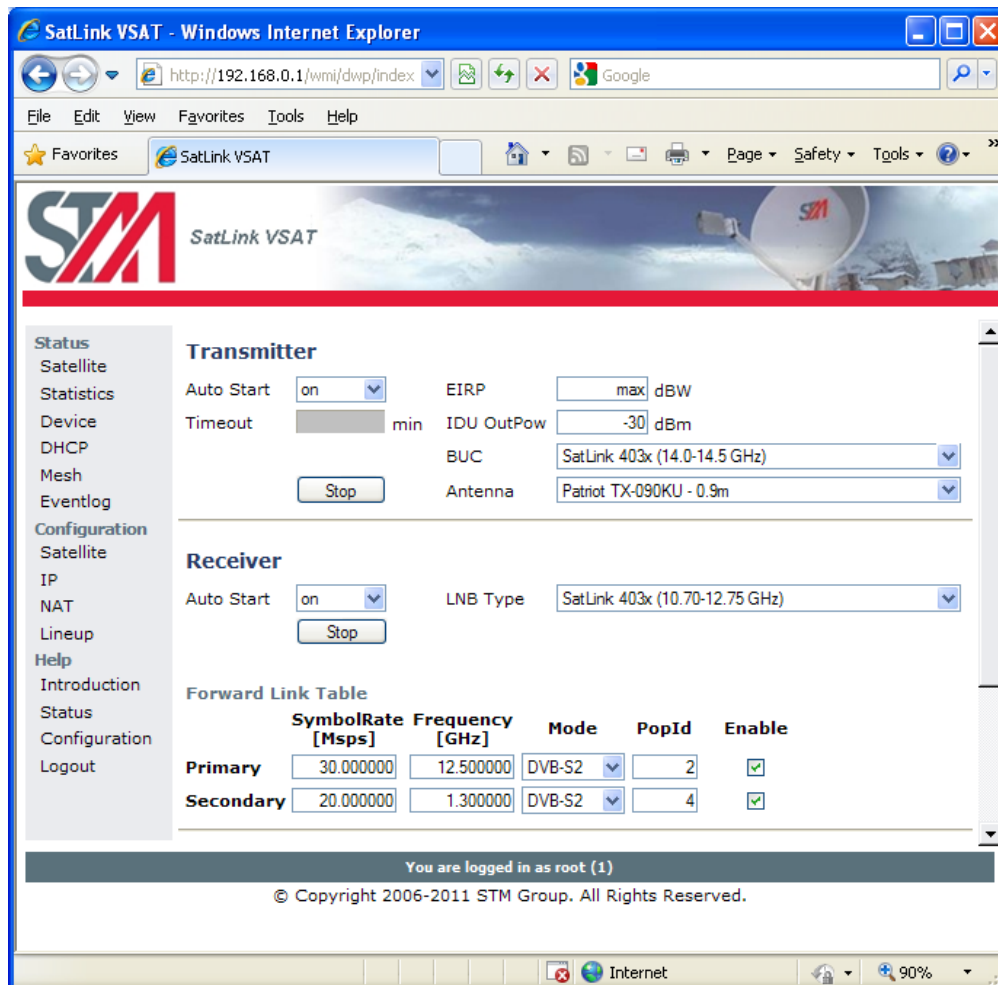


Figure 32 : Transmitter Auto Restart

- 3) Click the *Save* button to save the configuration.



7. Status Monitoring Using the SatLink Web Interface

The SatLink web interface is used to display the status of the SatLink VSAT. An operator can view the status information of the satellite interface, packet and burst statistics, device information, the status of the DHCP server, and the status of mesh and terminal burst receiver.

7.1 Satellite Interface Status

The satellite option provides an overview of the status on the satellite interface, such as the state, transmitter and receiver. Select the *Satellite* option under **Status** on the SatLink web interface home page to open the Satellite Interface Status page.

The screenshot shows the SatLink VSAT web interface in a Windows Internet Explorer browser. The address bar shows the URL http://192.168.252.5/wmi/dwp/index_page.dwp. The page title is "SatLink VSAT". The left sidebar contains a navigation menu with the following items: Status, Satellite, Statistics, Device, DHCP, Eventlog, Configuration, Satellite, IP, NAT, Lineup, Help, Introduction, Status, Configuration, and Logout. The main content area is titled "Satellite Interface Status" and contains the following information:

- Satellite Interface Status**
 - State: Two-way link established
 - Transmitter: On
 - Receiver: On
- Satellite Receiver Status**
 - State: Forward link up
 - Network ID: 65281
 - Network Name: STM T11NATL Beam
 - Mode: DVB-S2
 - FEC Rate: 3/4
 - Modulation: QPSK
 - Roll-off: 20%
 - Frame Length: LONG
 - Pilot: On
 - Transmission Mode: CCM
 - Frequency: 11.652748 GHz
 - Symbol Rate: 1.666874 Msp/s
 - Error Rate: 0
 - SNR: 12.3 dB
 - Rx Input Power: -42 dBm

At the bottom of the page, it says "You are logged in as root (1)" and "© Copyright 2006-2011 STM Group. All Rights Reserved."

Figure 33: Satellite Receiver Status

Parameter	Description
State	Specifies the state of the satellite (DVB) interface. During normal operation, it reads "Two-way link established".
Transmitter	This determines the transmitter status. During normal operation, it reads "On".
Receiver	This specifies the receiver status. During normal operation, it reads "On".



Satellite Receiver Status

The satellite receiver status option displays the detailed view of the receiver status. The operator can view the receiver state, network ID, network name, mode, FEC rate, modulation, roll-off, frame length, pilot, transmission mode, error rate, frequency, SNR, symbol rate, and Rx Input power of the satellite receiver.

Parameter	Description
State	Specifies the receiver state. During normal operation it reads "Forward Link up".
Network ID	This determines the DVB network ID of the Forward Link.
Network Name	The DVB network name of the Forward Link.
Mode	This specifies whether the Forward Link is a DVB-S or DVB-S2 carrier.
FEC rate	Detected FEC rate on the Forward Link.
Modulation	Specifies the detected modulation of the Forward Link.
Roll-off	Detected Roll-off factor of the Forward Link.
Frame length	Long or short frame
Pilot	Off or On
Transmission mode	CCM or ACM
Error-rate	The number of errors detected by the Viterbi decoder during a fixed time period.
Frequency	The measured receive frequency for the Forward Link.
SNR	This determines the current measured signal to noise ratio for the received Forward Link signal.
Symbol rate	The measured symbol rate for the Forward Link.
Rx Input power	

Satellite Transmitter Status

The satellite transmitter status option displays the detailed view of the receiver status. The operator can view the transmitter state, IDU output power, ODU output power, EIRP, Frequency offset, Timing offset, Capacity and SNR of the satellite transmitter.

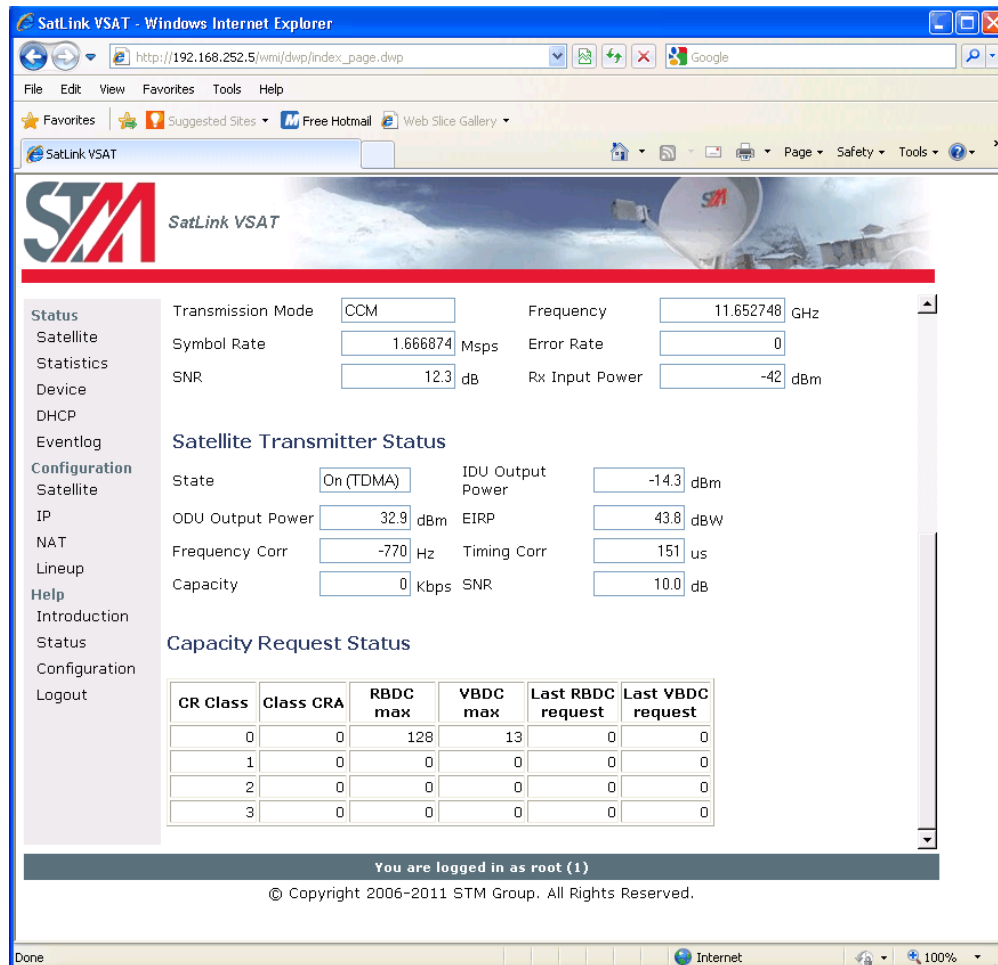


Figure 34: Satellite Transmitter Status

Parameter	Description
State	Specifies the transmitter state. During normal operation it reads "On".
IDU Output Power	This specifies the current power level transmitted by the IDU.
ODU Output Power	Determines the current power level transmitted by the ODU.
EIRP	This parameter specifies the current EIRP transmitted by the VSAT. Note that the value displayed will only be correct if the antenna is correctly specified on the satellite configuration page.
Frequency Corr	Current frequency offset of the Return Link transmitter.
Timing Corr	Current timing offset of the Return Link transmitter.
Capacity	Shows the Return Link bandwidth currently being allocated to the Return Link transmitter.
SNR	Shows the SNR of the transmitted Return Link signal as received at the other end of the link.

7.2 Statistics

The statistic option displays the status for IP packets statistics, Multi field classifier statistics, Forward Link statistics, and Return Link statistics. Select the *Statistics* option on the SatLink web interface home page.

IP Packets Statistics

The IP Packets table gives IP packet statistics on the VSATs interfaces. The statistics are collected on two interfaces: LAN (Ethernet) and DVB (Satellite). For each interface, the table contains the number of IP packets and the number of bytes that have been received, transmitted, and discarded at the given interface.

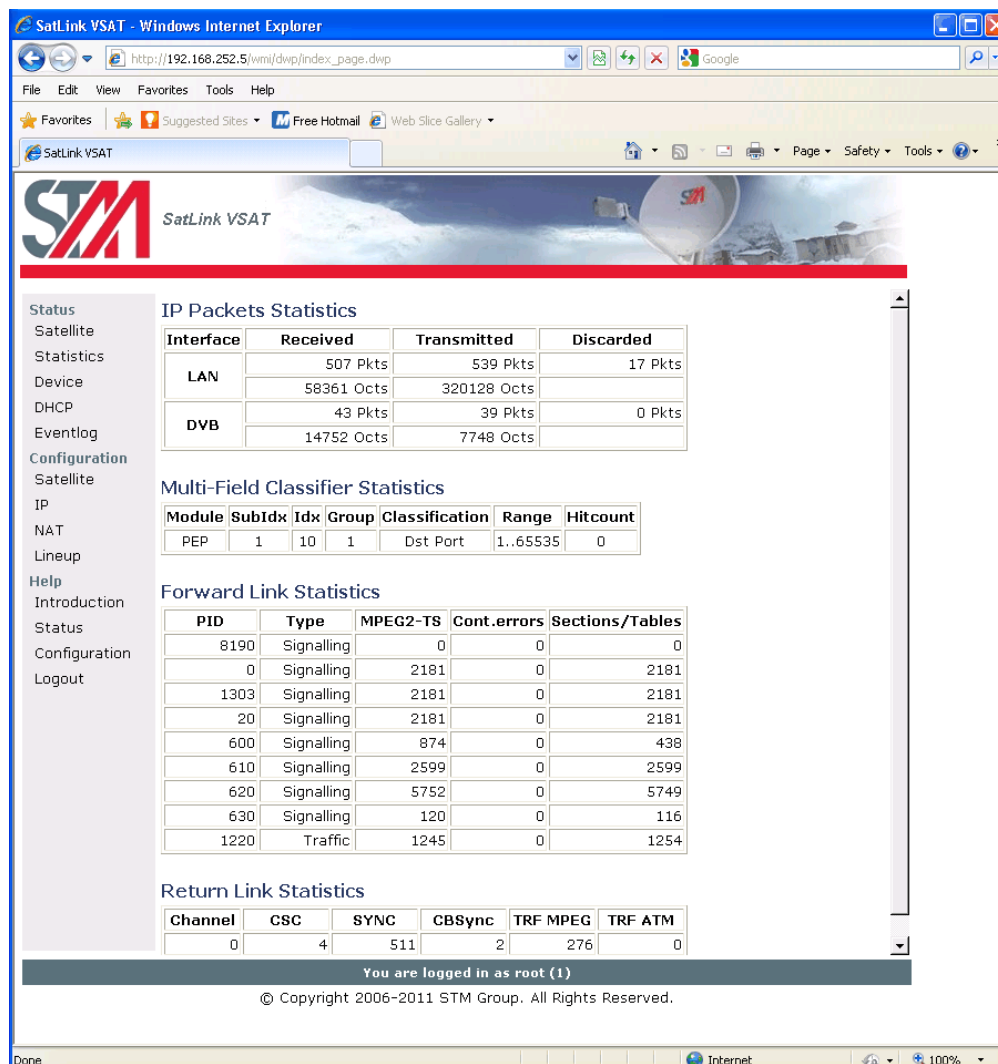


Figure 35: SatLink VSAT Statistics

Multi-Field Classifier Statistics

The Multi-Field Classifier table displays information about the configuration of the MFC table. A multi-field classifier is used by the VSAT to determine the QoS group an IP packet to be transmitted on the Return Link belongs to by performing a look-up in a classification table. The MFC is also used to determine the handling of TCP connections by the Performance Enhancing Proxy client (TCP PEP).

Forward Link Statistics

The Forward Link table displays the statistics for the satellite Forward Link (receiver). Traffic on the Forward Link is arranged on different PIDs (Packet Identifier); for each PID, there is one row in the table.

Return Link Statistics

The Return Link table displays the statistics for the satellite Return Link (transmitter). The Return Link transmission is segmented in bursts. The table shows how many bursts have been sent since logon for the following burst types:

7.3 Device Status

The Device option in the SatLink web interface displays the device status information as displayed in the following figure and table. Select the *Device* option on the SatLink web interface home page to open the Device status page.

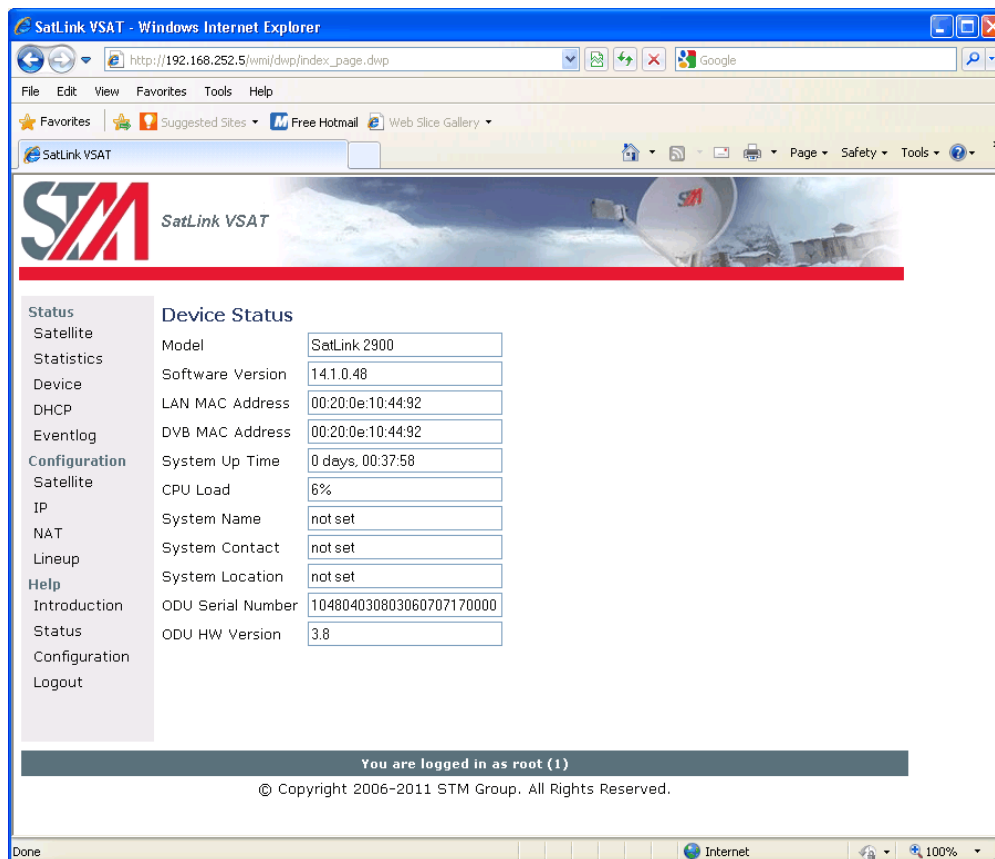


Figure 36: Device Status

Parameter	Description
Model	VSAT hardware model
Software version	This specifies the version number (including build number) of the application software currently running.
LAN MAC address	MAC address of the LAN (Ethernet) interface of the VSAT.
DVB MAC address	MAC address of the DVB (satellite) interface of the VSAT.
System UP Time	Time elapsed since last VSAT boot.
System time	UTC time (only displayed if UTC time is broadcasted by the Gateway).
CPU load	Current load of VSAT CPU.
System name	Specifies the Name of VSAT. This and the following two parameters are MIB objects in the MIB-II systems group and can be set via SNMP or from the CLI using the “device” menu.
System contact	Name of the contact person and/or company, who is responsible for this VSAT.
System location	This determines the Location of the VSAT.
ODU Serial Number	Specifies the serial number of the ODU for VSATs configured with a SatLink 403x ODU.
ODU HW Version	Specifies the HW revision for VSATs configured with a SatLink 403x ODU.

7.4 DHCP Server Status

The DHCP option in the SatLink web interface provides information about the status of the DHCP server and the DHCP client table, such as DHCP status, Server IP address, Server IP address range, Number of IP addresses excluded, Lease time and Excluded IP address range. Select the *DHCP* option in the SatLink web interface home page to open the DHCP Server Status page.

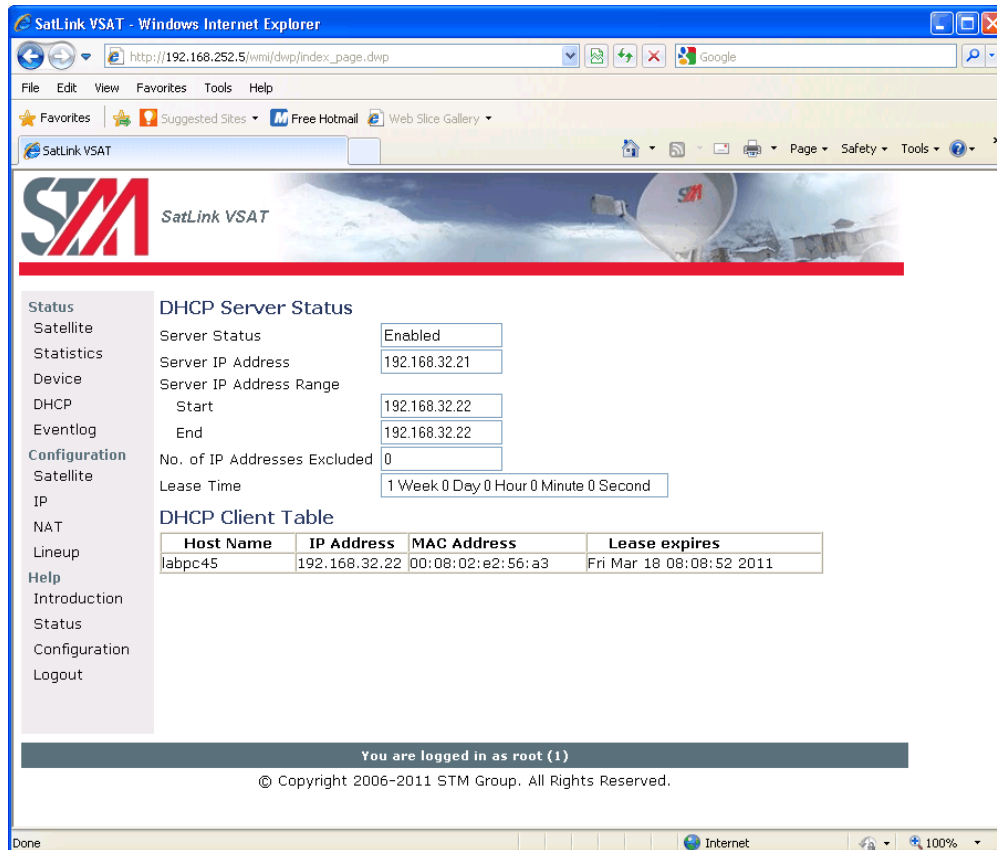
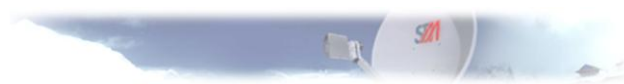


Figure 37: DHCP Server Status

Parameter	Description
Server status	Determines whether the DHCP server is enabled or disabled.
Server IP address	The IP address of the DHCP server.
Server IP address range	The pool of IP addresses that the DHCP server can lease to the DHCP clients.
Number of IP addresses excluded	The number of IP addresses that are not allocated from the server's IP address range. These addresses are typically used for hosts on the VSATs LAN that require static IP addresses.
Excluded IP address range	It is a subrange of the server IP address range, containing IP addresses that should not be allocated by the DHCP server. This range is an interval; it is defined with the help of the starting IP address and the ending IP address for the excluded range.
Lease time	Time period for which an IP address is leased to a DHCP client

The DHCP client table shows information about the IP addresses that are currently leased from the DHCP server: host name, IP address, MAC address, and lease time expiration. The DHCP server will only lease IP addresses to the LAN hosts for 15 minutes until it has acquired the network time. The DHCP server will apply the configured lease time when the network time is acquired.



8. Using the Command Line Interface of the SatLink VSAT

The command line interface can be accessed via either Telnet or the RS-232 port for management of the SatLink VSAT IDU, as well as for showing status and reports.

8.1 CLI User Access Rights

Four levels of CLI user access rights are available for differentiating user privileges:

- Level 2: installer
- Level 3-5: end users

When shipped from the factory, one user is pre-configured in the SatLink VSAT:

User name	Factory default password	Privilege level
install	dvbrcs	2

If the login prompt is not displayed when accessing the CLI via RS-232, type <ENTER>. The login prompt, `Login:` should then be displayed. Then login with the install user:

```
Login: install
Password: dvbrcs
```

When the command prompt is displayed, you will now have access to the CLI with privilege level 2.

New users may be added with the CLI command `user add`, existing users deleted with the CLI command `user del`, and the password of the current user or users with lower privilege levels can be changed with the CLI command `user passwd`. To list all defined users with lower privilege level than the user currently logged in, use the CLI command `user show`. Type `? user` to get further help on the user commands.

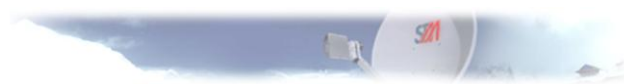
For security reasons, we recommend that you change the factory set password to your own personal one.

8.2 Online Help

In the CLI, a list of available commands can be displayed by typing `? <ENTER>` (question mark and the ENTER key). The CLI command groups will then be shown:

Example:

```
# ?
? : ? <submenu|command>
device : Device configuration
dvb : DVB interface configuration
eth : Ethernet configuration
ip : IP configuration
log : Event log
misc : Miscellaneous commands
odu : ODU configuration
sw : Software upgrade & licenses
user : User configuration
```



To display the available commands within one sub-menu, type ? <sub-menu>.

Example:

```
?
? ip
show      : ip show [-mcast]
tracert   : ip tracert [<options>] <ipaddr>
set       : ip set <ifnum> {<ipaddr> <mask>}|nonum
addroute  : ip addroute <destaddr> <netmask> [<next hop>] [<if>]
delroute  : ip delroute <destaddr> [<netmask> [<next hop> [<if>]]]
intf      : Interface configuration
gre       : GRE Configuration
dhcp      : DHCP configuration
dns       : DNS configuration
nat       : NAT configuration
qos       : IP QOS configuration
mfc       : IP Multi Field Classifier (MFC) configuration
lac       : IP Link Access Control (RAC) configuration
pep       : PEP configuration
hc        : Header compression configuration and status
udpsend   : ip udpsend <options>
udprecv   : ip udprecv <options>
```

To get further help on a specific CLI command, type ? <cmd>.

Example:

```
# ? ip set
```

USAGE:

```
ip set <ifnum> <ipaddr> <mask> |nonum
```

```
ifnum    Interface number (1=LAN, 3=Satellite)
```

```
ipaddr   IP address for the interface
```

```
mask     Netmask for the interface
```

```
nonum    Use nonum instead of ipaddr and mask to remove the IP address
```

Set the IP address and subnet mask for the specified interface

If the interface is Virtual-VLAN, then the IP should be from the subnet of its source VLAN.

If the interface is a VLAN, then its corresponding virtual VLANs IP will be cleared.

Example:

```
ip set 1 10.10.1.1 255.255.255.248    will set the LAN IP address to
                                       10.10.1.1 and the LAN netmask to
                                       255.255.255.248
```

See also:

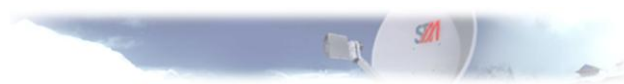
```
ip show, ip addroute, ip delroute
```

8.3 Logging of Events

The SatLink VSAT logs certain events to a log stored in the RAM. See Appendix K.5 for a list of the different events and required actions. Use the CLI command `log show` to show the log in memory.

The events are divided into four different severity levels:

0. Minor
1. Normal
2. Major
3. Critical



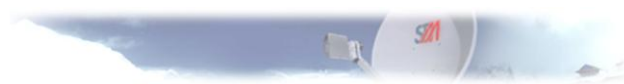
Events with severity level Major will normally cause disruption in the data transfer, while events with severity level Critical normally will require user intervention in order to restore the data communication with the DVB-RCS Hub.

To have access to the log of events after the VSAT software has been rebooted, the event above a specified severity level can be logged to file. Use the CLI command `log file` to enable logging of events to file, set the minimum severity level of events that shall be logged to file, and set the maximum size for the logfile. By default, Major and Critical events are logged to file.

8.4 CLI Command Summary

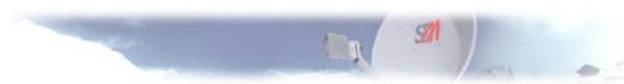
The available CLI commands are listed below.

CLI commands	Available in Boot SW	Available in Application SW	User Privilege Level
? [sub-menu] [cmd]	x	x	5
del <filename>	x	x	2
ren <filename1> <filename2>	x	x	2
mv <filename1> <filename2>	x	x	2
type <filename>			
setrows <row-number>			
dir [ext]	x	x	5
type <filename>	x	x	5
dload <filename> <ipaddr> [<localname>]	x	x	2
upload <filename> <ipaddr> [<remotename>]	x	x	3
ping {<ipaddr> [<options>]} -stop <-enablemonitor disablemonitor	x	x	5
exit	x	x	5
logout	x	x	5
restart	x	x	3
save config		x	3
arp flush <all static dynamic>		x	3
arp show		x	5
device snmp show		x	1
device snmp community <name> <ro rw> [<ipaddr> <mask>]		x	1
device snmp delcommunity <name>		x	1
device manager show		x	1
device manager add <func> <if> [<ip> <mask>]		x	1
device manager del <func> <if> [<ip> <mask>]		x	1
device manager httpport <port>			
device name <name>		x	2
device contact <contact>		x	2
device location <location>		x	2
device show [-dvbs2]		x	5
device telnet show [-session id]		x	5
device telnet disconnect <session id>		x	1
dvb atmmod <mode>		x	2
dvb hdrcomp <mode> -show		x	2
dvb cr capacity <crClass> <CRA> <RBDCMax> <VBDCMax>			
dvb cr timeout <RBDCtimeout VBDCtimeout>			
dvb cr interval [-vbdc <interval>]			
dvb cr show [-timeout -interval -capacity]			



CLI commands	Available in Boot SW	Available in Application SW	User Privilege Level
dvb brx show [-stats]			
dvb brx stats [enable disable]			
dvb brx offset <freq>			
dvb brx cscLog <value>			
dvb mesh show [-links -config -routes -stat]			
dvb mesh enable			
dvb mesh disable			
dvb tx autostart <on off traffic> [<timeout>]		x	2
dvb tx calibrate [<freq> [<timeout>]]		x	2
dvb tx cw <on off> [-notrack] [<pow> [<freq> [<timeout>]]]		x	2
dvb tx cwfreq <freq>		x	2
dvb tx eirp <eirp>		x	2
dvb tx logoff		x	3
dvb tx logon		x	3
dvb tx outpow [-max] <pow>		x	2
dvb tx show [-burst -capacity -queue -ts]		x	5
dvb tx pause -dc <on off> [<timeout>]			
dvb tx start		x	3
dvb tx stop		x	3
dvb rx autostart <on off>		x	2
dvb rx start		x	3
dvb rx stop		x	3
dvb rx fwdlink <idx> <pri> [-del -disable -enable][<symbrate> [<freq> [<mode> [<popid>]]]]		x	3
dvb rx phy [-internal -satlink100 -satlink110]		x	2
dvb rx show [-pid -cnt]		x	5
dvb rx watchdog <min>[<restartOnMissingTable>]		x	2
dvb rx tablecache <on off> [<tunerRetryTime>]			
		x	2
dvb pos lat <deg> <min> <mindec> <dir>		x	2
dvb pos long <deg> <min> <mindec> <dir>		x	2
dvb pos alt <height>		x	2
dvb pos delayburst <tics nera satlabs -s2ccm <satlabs satlink> >		x	2
dvb pos show		x	5
dvb mesh show <-links -config -routes -stat>		x	
dvb mesh enable		x	
dvb mesh disable		x	
eth mode <mode> ¹		x	3
eth vlan [-del -allow -block] <id>		x	2
eth primap [-del] <pri> <qos>		x	2
eth show		x	5
ip addroute <destaddr> <netmask> <next hop> <ifnum>	x	x	2
ip delroute <destaddr> [<netmask> [<next hop>	x	x	2

¹ CLI command is only available when corresponding SW license key is set



CLI commands	Available in Boot SW	Available in Application SW	User Privilege Level
[<if>]]]			
ip mfc mask <module id> <sub index> <index>		x	2
<group> {{+ -} <tag> <tag-params>}+			
ip mfc show [module id]		x	5
ip qos show		x	5
ip set <ifnum> {<ipaddr> <mask>} nonum	x	x	2
ip show [-mcast]	x	x	5
ip dns server <primary> [secondary]		x	2
ip dns flush		x	3
ip dns resolve <domain>		x	3
ip dns show [-cache]		x	5
ip intf add <if>		x	2
ip intf del <if>		x	2
ip intf addroute <ifin> <ifout>		x	2
ip intf delroute <ifin>		x	2
ip nat enable		x	2
ip nat disable		x	2
ip nat global <add del> <gladdr> [<interface>]		x	3
ip nat static <add del> <gladdr> [<locaddr>]		x	3
ip nat napt add <gladdr> <globport-first>		x	3
[<port-range>] <locaddr> <locport-first>			
[<if>] del <gladdr> <globport-min> [<if>]]			
ip nat <show>		x	5
ip dhcp <enable> [<interface>]		x	3
ip dhcp disable			
ip dhcp show		x	5
ip dhcp leasetime <time> [unit]		x	3
ip dhcp exclude <no> [<interface>]		x	3
ip gre add <destaddr> <netmask> <tunnelipaddr>		x	2
[<if>] ¹			
ip gre del <ifnum>		x	2
ip gre show		x	5
ip pep disable [httpa] ¹		x	2
ip pep enable [redirect trans httpa]] ¹		x	2
ip pep server <pepsrvipadd> ¹		x	2
ip pep show [-cache]		x	5
ip pep flush -cache			
ip pep bypass <-add -del -show -reset> [<URL>] ¹		x	3
ip pep dynbypass <options> ¹		x	3
-			
ip pep httpmux <options>			
ip tracert [<options>] <ipaddr>			
ip lac rpf {enable disable}			
ip lac srceqdest {enable disable}			
ip hc rtp [show enable disable>] [comp			
<info stat {cid} bklist >] [decomp <info			
stat {cid} >]			
ip udpsend <options>		x	5
ip udprecv <options>		x	5
log file <enable disable> [<severity>		x	3
[<filesize>]]			
log show [<number> <-all> <-conf> [-file		x	5
<number>]			



CLI commands	Available in Boot SW	Available in Application SW	User Privilege Level
odu lnb <type>		x	2
odu txttype <type>		x	2
odu antenna <type>		x	2
odu show [-diseqc]		x	5
sw license <feature> <key>		x	2
sw mcast <value> [<pid>] [<addr>] [<port>]		x	2
sw upgrade [-default] [<filename> [<tftp-ip-addr>]]		x	2
sw restore		x	2
sw show		x	5
user add <username> <passwd> [<userlevel>]	x	x	4
user del < username>	x	x	4
user passwd [<oldpasswd> <username> <newpasswd>]	x	x	5
user show	x	x	5



9. SatLink VSAT Configuration and Line-up Using the Command Line Interface

Follow all the procedures below when installing the SatLink VSAT and lining up the ODU using the command line interface of the SatLink VSAT.

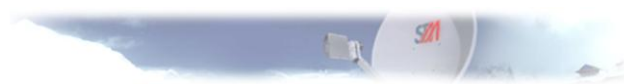
9.1 Power On and Log On

- 1) To view the boot processes of the SatLink VSAT, connect a PC to the serial interface and launch a Terminal Emulator as described in Appendix A. Otherwise, go to step 2.
- 2) Turn on the power of the SatLink VSAT.

When turning on the SatLink VSAT, the Boot SW is loaded first. A message such as the one below is displayed on the CLI serial console when the boot SW starts. Telnet is not available until the application has been started.

```
Boot-loader
- SW ID 120511, Revision 14.1.0 Build 5
File system initialised
Ethernet Mode (eth0): 100Mbps/Full
Press CTRL+A to abort and enter boot loader
```

Under normal circumstances, the user should not need to enter the boot-loader and should ignore the “press return to enter boot-loader” message. The DVB-RCS application will load automatically once the boot SW load has completed. See Appendix J for further details concerning the boot SW. If access to the boot-loader is required, press return within 10 seconds to display the login-prompt for entering the boot-load. After the timer has expired, the DVB-RCS application will be loaded. The message `Loading application` will be shown when the application starts to load.



- 3) Wait for the application software to be loaded and activated (typically takes 1-1.5 minutes). The power LED on the front of the SatLink VSAT will blink when the SW is booting and will stay on when the SW has successfully started. If watching the boot process on the RS-232 output, a printout similar to this will be displayed when the SW has booted:

```

Loading application.....
SatLink 2900
- Main board ID 120265, Revision R2.1
- SW ID 120208, Revision 14.1.0 Build 41

File system initialised
Ethernet Interface 1 MAC Address: 00:20:0e:10:44:92
Ethernet Interface 2 MAC Address: 00:20:0e:10:44:93
DVB Interface MAC Address: 00:20:0e:10:44:92
Retrieving configuration....done

```



When the SatLink VSAT is configured for use with the SatLink 4033/4035 transceiver and the TX cable is not connected to the ODU, the following error message will be shown when the SW has booted:

```

ODU Initialisation failed. Unable to establish DiSEqC communication.
Please check connection to ODU and that the ODU supports
DiSEqC communication

```

This is normal and just indicates that the VSAT cannot communicate with the transceiver since the cable is not yet connected.

- 4) At this point, the Telnet server in the SatLink VSAT is started and a Telnet session can be opened for managing the VSAT. Local Echo must be enabled in the Telnet Client if the input from the keyboard shall be displayed. Recommended Telnet clients are Tera Term (see Appendix C), PuTTY², and the built-in Telnet client in Windows. Note that Local Echo by default is set to “off” in Windows XP. Alternatively, HyperTerminal or another terminal emulator connected via the serial interface can be used (see Appendix A). From this point, the SatLink VSAT can also be managed via the Web interface and SNMP.

Use the SatLink VSAT’s Satellite Interface (DVB) IP address when using Telnet over the satellite link (from the Hub), and the VSAT’s LAN (Ethernet) IP address when using Telnet from the local LAN.

When shipped from the factory, the SatLink 1000, 1910, 2000, and 2900 VSAT LAN (Ethernet) IP-addresses are set to 192.168.0.1 and the subnet mask to 255.255.255.0. If the SatLink VSAT LAN (Ethernet) IP address has been changed from the factory default to an unknown address, one must use CLI via serial COM port to do the initial configuration.

The SatLink VSAT can handle, at most, three simultaneous Telnet connections, including aborted connections. The Telnet session will be automatically terminated after 20 minutes of inactivity. If a Telnet session is refused, this can be due to all three connections being aborted. Please wait until the timeout has expired and try again.

² <http://www.chiark.greenend.org.uk/~sgtatham/putty/download.html>



5) Login as the administrator user `install` with the factory default password `dvbrcs`:

```
Login:      install
Password:   dvbrcs
```



The user must press Enter once to get the login-prompt to display if using the CLI via serial port. If the input from the keyboard is not displayed when typing the username and password, check that the Local Echo is enabled in the Telnet client.

6) The SatLink VSAT should now be ready to be configured as described in the following sub-sections.

9.2 Initial Configuration of Parameters

The VSAT must be configured with a number of parameters before the VSAT can acquire the Forward Link and communicate with the network Hub. A default configuration specifying most of these parameters is usually pre-loaded on each VSAT, either in the factory or by the service provider before installation. The parameters that usually need to be configured by the installer are:

- Antenna to be used
- Forward Link frequency and symbol rate
- VSAT population ID
- VSAT geographical position



Most SatLink networks enforce automatic configuration of VSAT parameters, like IP addresses, DHCP server configuration, DNS server, SW licenses, and PEP parameters when the VSAT logs on to the network for the first time. For manual configuration of these parameters, refer to Appendix H.



9.2.1 Antenna and ODU Parameter Configuration

The VSAT is normally pre-configured to be used together with the SatLink 403x Transceiver. The CLI command `odu show` will show the ODU configuration with the two parameters, ODU transmitter type and ODU receiver type, both set to SatLink 403x.

It is possible to configure the VSAT to operate together with transmitters and receivers other than SatLink 403x. The valid ODU transmitters (BUC) are listed in Table 9 and the valid ODU receivers (LNB) are listed in Table 11 (the list is also available using the CLI help command `? odu txttype`). Choosing the ODU transmitter to be SatLink 403x will automatically lock the ODU receiver type to SatLink 403x.

Please make sure that the correct ODU transmitter (BUC) type is selected according to the table below, as the Return Link communication will not work otherwise.

ODU Transmitter # (type)	ODU Transmitter (BUC)	STM Product Number (P/N)	HW Revision
Ku-band			
11	STM SatLink 403x	106546 (SatLink 4035)	All
		104804 (SatLink 4033)	All
20	Norsat 1010XRT / 1020XRT		All
30	Invacom TUL-204	104041	All
42	JRC NJT5096		All
43	JRC NJT5097		All
45	JRC NJT5017		All
46	JRC NJT5118 w/ext		All
47	JRC NJT5037, 14.0-14.5 GHz		All
65	ND SatCom RFT 35W		All
71	CODAN 6908 w/ext		All
72	CODAN 6916 w/ext		All
75	Actox ABAXKUS		All
C-band			
80	JRC NJT5652	105268	All
81	JRC NJT5656	105269	All
92	Zinwell ZTX-C3300F	105701	All
90	Zinwell ZTX-C3301F	105276	All
93	Zinwell ZTX-C3700F	105700	All
91	Zinwell ZTX-C3701F	105274	All
95	NexGenWave TA33BPXE-01		All

Table 9: Overview of supported ODU transmitters (BUCs)

To configure use of an ODU transmitter (BUC) listed in the table above, please enter the CLI command `odu txttype <type>` where `type` is the number from the first column in the table above.

Example:

```
# odu txttype 45
```

This selects the JRC NJT5017F transmitter. Use the command `odu show` to view the ODU configuration parameters.



When using the SatLink 4033/4035 Transceiver, the VSAT must be configured with the antenna type in use in order to calculate the transmitted EIRP correctly. The following antennas are supported:

Antenna # (type)	Antenna (Ku-band)	Size
21	ASC Signal Type 845TX	0.84m
2	ASC/Andrew/Channel Master Type 960	0.96 m
1	ASC/Andrew/Channel Master Type 123	1.20 m
5	ASC/Andrew/Channel Master Type 184	1.80 m
7	ASC/Andrew/Channel Master Type 244	2.40 m
11	Patriot TX-090KU	0.90 m
12	Patriot TX-100KU	1.00 m
13	Patriot TX-120KU	1.20 m
14	Patriot TX-240KU – BATWING	2.40 m
15	Prodelin Series 1132	1.20 m
16	Prodelin Series 1184	1.80 m
17	Prodelin Series 1250	2.40 m
18	Seatel 2406	0.6m
19	Seatel 4006	1.0m
20	Seatel 6006	1.5m
22	Raven G98	0.98m
6	Visiosat	0.75m
8	Seatel 4003	1.00 m
9	Visiosat KIT 90 EMIT	0.90 m
10	Visiosat KIT 120 EMIT	1.20 m

Table 10: Overview of Supported Antenna Types

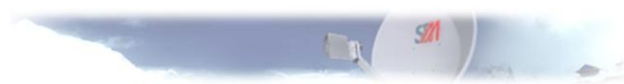
Please see Appendix G (Table 22) for more detailed information regarding the antennas that can be used with the SatLink 403x transceiver.

The VSAT is normally pre-configured to use the Patriot 0.96m antenna. If another antenna listed in the table above is to be used, please enter the CLI command `odu antenna <type>` where `type` is the antenna number from the first column in the table above.

Example:

```
# odu antenna 13
```

This selects the Patriot 1.2 m antenna. Use the command `odu show` to view the ODU configuration parameters.



Example:

```
# odu show
```

Antenna

```
-----
Type                Patriot TX-090KU - 0.9m
Antenna controller  None
Tx Gain at 14.25 GHz 40.9dB
```

Transmitter (BUC) Configuration

```
-----
Type                STM SatLink 4033 (14.0-14.5 GHz)
ODU Serial No.      104804030303051100020000
ODU HW Version       3.3
ODU SW Version       1.3
Local oscillator     13.050000 GHz
24V DC supply        On
Temperature          12 Deg C
```

Receiver (LNB) Configuration

```
-----
Type                STM SatLink 403x (10.70-12.75 GHz)
Local oscillator - LO1 10.600000 GHz
Local oscillator - LO2 9.750000 GHz
Oscillator switching frequency 11.700000 GHz
LO Switching mode    22kHz
13/18V DC supply     13V
```

The SatLink VSAT can be configured with one of the following LNBs:

ODU LNB # (type)	ODU LNB	STM P/N
Ku-band		
20	Invacom SPV-1SM	100816
22	Invacom SPV-30SM	
23	Invacom SPV-31SM	
30	Zinwell ZK-VJ1	104730
40	JRC NJR2535S	
41	JRC NJR2536S	
42	JRC NJR2537S	
43	JRC NJR2183F	
71	AZIMUTH AZ-QLKUF01 4-band	
72	SMW Q-PLL Type R	
C-band		
80	Zinwell ZC-VD1	105267
85	Norsat 8XXX-series	
95	NexGenWave NEX-800	

Table 11: Overview of supported ODU receivers (LNB)

Enter the CLI command `# odu lnb <lnbtype>` where `lnbtype` is the number from the first column in the table above to configure the correct LNB.



When ODU BUC is chosen to be the SatLink 403x transceiver, the LNB will automatically be set to the SatLink 403x. The SatLink VSAT will detect the SatLink transceiver model being used (i.e., SatLink 4033 or 4035) and display the detected model in the ODU Transmitter (BUC) Type field in the CLI `odu show` output.



Example:

```
# odu lnb 20
```

This selects the Invacom SPV-1SM LNB. Use the command `odu show` to view the ODU configuration:

```
# odu show
```

Antenna

Type	Patriot TX-090KU - 0.9m
Antenna controller	None
Tx Gain at 14.25 GHz	40.9dB
Transmitter (BUC) Configuration	

Type	Invacom TUL-204 (14.0-14.5 GHz)
Local oscillator	13.050000 GHz
24V DC supply	On

Receiver (LNB) Configuration

Type	Invacom SPV-1SM (10.70-12.75 GHz)
Local oscillator - High band	10.600000 GHz
Local oscillator - Low band	9.750000 GHz
Oscillator switching frequency	11.700000 GHz
LO Switching mode	22kHz
13/18V DC supply	13V

Finally, save the configuration to flash memory using the command `save config`.



The VSAT must be restarted for the new ODU configuration to take effect.

9.2.2 VSAT Geographical Position

In order to calculate the delay to the satellite correctly for the logon burst, the VSAT must be configured with its own ODU position.



The VSAT, by default, uses the timing compensation procedure as specified by SatLabs. For using the VSAT with a DVB-RCS Hub requiring proprietary timing compensation, refer to Appendix M.

- 1) Find the position of the location where installing the VSAT ODU using a standard GPS.



The VSAT position is entered in one of the following two formats:

- a) degrees, minutes, 1/100 minutes, and direction
- b) degrees, minutes, seconds, and direction

To convert between the two formats use the formula $1/100 \text{ minutes} = (\text{seconds}/60) \times 100$

Entering the direction as a number {0,1} selects format a, while entering the direction as a letter {'n','s','e','w'} selects format b.



2) Configure the latitude:

Format a: Enter the CLI command `dvb pos lat <deg> <min> <mindec> <dir_number>`, where

deg = degrees [0 – 90]
 min = minutes [0 – 59]
 mindec = 1/100 minutes [0 – 99]
 dir = direction. 0 = North. 1 = South.

Format b: Enter the CLI command `dvb pos lat <deg> <min> <sec> <dir_letter>`, where

deg = degrees [0 – 90]
 min = minutes [0 – 59]
 sec = seconds [0 – 59]
 dir = direction. 'n' = North. 's' = South.

Example:

```
# dvb pos lat 59 52 15 0
or
# dvb pos lat 59 52 09 n
sets the latitude to 59°52.15'N.
```

3) Configure the longitude:

Format a: Enter the CLI command `dvb pos long <deg> <min> <mindec> <dir_number>`, where

deg = degrees [0 – 180]
 min = minutes [0 – 59]
 mindec = 1/100 minutes [0 – 99]
 dir = direction. 0 = East. 1 = West.

Format b: Enter the CLI command `dvb pos long <deg> <min> <sec> <dir_letter>`, where

deg = degrees [0 – 180]
 min = minutes [0 – 59]
 sec = seconds [0 – 59]
 dir = direction. 'e' = East. 'w' = West.

Example:

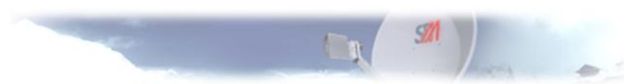
```
# dvb pos long 10 29 05 0
or
# dvb pos long 10 29 03 e
sets the longitude to 10°29.05'E.
```

4) Configure the altitude:

– Enter the CLI command `dvb pos alt <height>` where
 height = height in meters

Example:

```
# dvb pos alt 60
sets the altitude to 60 meters.
```



5) Verify the VSAT position:

- Enter the CLI command `dvb pos show`

Example:

```
# dvb pos show
Latitude       : 59d 52.15'N ( 59d 52' 9''N )
Longitude      : 10d 29.05'E ( 10d 29' 3''E )
Altitude       : 60 m
Timing Reference : SatLabs
PositionSearchN : 10
Position Search Offset : 0
Pos Large Uncertainty : First
Pos LTU Done    : No
#
```

7) Save the VSAT position to flash memory:

- Enter the CLI command: `save config`

9.2.3 Forward Link Parameters

The Forward Link parameters are used to identify the Forward Link (outbound link) that is transmitted from the Hub to the DVB-RCS VSATs. To set the symbol rate and receive frequency of the Forward Link, use the following CLI commands:

```
dvb rx fwdlink <idx> <pri> [<symbrate> [<freq> [<mode> [<popid> [<satpos> [<rxpol> [<txpol>
[<satpolrot>]]]]]]]
```

idx	Table index [0 – 9]. The SatLink VSAT can store up to 10 Forward Link entries and the table index is used to identify a single entry. For configurations with only one Forward Link entry, it is recommended to set this parameter to 0. Adding a new entry with the same index will overwrite an existing Forward Link entry.
pri	Forward Link search order [0 – 9]. Search is started for priority 0 first and ends with priority 9. For configurations with only one Forward Link entry, it is recommended to set this parameter to 0.
symbrate	Forward Link symbol rate [sps]
freq	Forward Link frequency [kHz]
mode	Valid modes: [dvbs, dvbs2]
popid	Population ID A popid value set to -1 means that the global popid value set using an earlier software version is used. View the global popid value by typing 'dvb tx show'.
satpos	Satellite orbital position of satellite in 1/10 degrees. Range -180.0 .. 180.0 (-1800..1800). Negative values indicate West.
rxpol	Specifying the polarization of the signal, 0 = horizontal, 1 = vertical
txpol	Specifying the tx polarization relative to the rx polarization 0 = Cross polarization (default), 1 = Co-polar
satpolrot	Satellite polarization rotation angle (satellite polarization skew) Range -15.0 .. 15.0 (-150..150). Negative values indicate West
del	Delete table entry.
disable	Disable table entry.
enable	Enable table entry.

Verify the settings by typing the CLI command `dvb rx show` and type `save config` to save the configuration.



Example:

```
# dvb rx fwdlink 0 0 24500000 11250000 dvbs2 2
# save config
# dvb rx show
```

Satellite (DVB) RX Configuration

```
-----
Auto start          : Enabled
RX watchdog         : 15 minute
```

Idx	Pri	SymbRate[Mbps]	Freq[GHz]	Mode	PopId	Enable
* 0	0	24.500000	11.250000	DVB-S2	2	Yes

Satellite (DVB) Receiver Status

```
-----
Rx State            : On
```

The above example shows how to configure the VSAT to use the following Forward Link:

- RX symbol rate: 24.500000 Msps
- RX frequency: 11.250000 GHz
- Mode: DVB-S2
- Population ID: 2

To delete the Forward Link, use the following CLI commands: `dvb rx fwdlink <idx> -del`

9.2.4 Multiple Beam Configuration

Multiple beam configuration can be used for Mobile VSATs, when they switch between different satellites and transponders.

It is also a useful feature when the Hub operator is changing the Forward Link frequency or symbol rate. Then the operator can configure both the current and the new Forward Link on the VSATs. When the old Forward Link is removed, the VSAT will start to search for the second one, and lock to it, if available. The VSAT will start tuning on the Forward Link configuration with highest priority (highest being 0 and lowest being 9). When it is able to lock to a Forward Link, it will use this configuration, and start looking for DVB-RCS tables distributed on the link. Up to 10 different Forward Link configurations can be configured in the VSAT.

Example:

```
# dvb rx show
```

Satellite (DVB) RX Configuration

```
-----
Auto start          : Enabled
RX watchdog         : 15 minute
```

Idx	Pri	SymbRate[Mbps]	Freq[GHz]	Mode	PopId	Enable
* 0	0	24.500000	11.250000	DVB-S2	2	Yes
1	1	1.200000	30.000000	DVB-S2	2	Yes
2	2	11.900000	11.000000	DVB-S2	2	Yes

The above example shows the VSAT locked to a DVB-S2 Forward Link with:

- RX symbol rate: 24.500000 Msps
- RX frequency: 11.250000 GHz
- Mode: DVB-S2



- Population ID: 2

The priority of any Forward Link entry can be changed from its existing priority by using the CLI command. The following example explains how to change the priority of Forward Link entries.

```
dvb rx show
```

```
Satellite (DVB) RX Configuration
```

```
-----
Auto start      : Enabled
RX watchdog     : 15 minute
```

Idx	Pri	SymbRate[Msps]	Freq[GHz]	Mode	PopId	Enable
* 0	1	24.500000	11.250000	DVB-S2	2	Yes

The priority number in the above example is 1 at index 0. The operator can change the priority number to 2 on the index 0 using the following CLI command:

```
# dvb rx fwdlink 0 2
```

To check the new priority at index 0 use the CLI command dvb rx show.

```
# dvb rx show
```

```
Satellite (DVB) RX Configuration
```

```
-----
Auto start      : Enabled
RX watchdog     : 15 minute
```

Idx	Pri	SymbRate[Msps]	Freq[GHz]	Mode	PopId	Enable
* 0	2	24.500000	11.250000	DVB-S2	2	Yes

The Forward Link for the VSAT can be set to enabled or disabled depending on its use in the network. The operator can enable a particular Forward Link or disable a Forward Link by using the following CLI commands:

To disable the Forward Link:

```
dvb rx fwdlink <idx> -disable
```

Example:

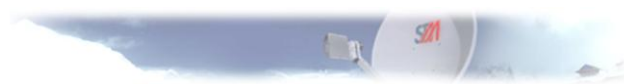
```
dvb rx fwdlink 1 -disable
# dvb rx show
```

```
Satellite (DVB) RX Configuration
```

```
-----
Auto start      : Enabled
RX watchdog     : 15 minute
```

Idx	Pri	SymbRate[Msps]	Freq[GHz]	Mode	PopId	Enable
* 0	2	24.500000	11.250000	DVB-S2	2	Yes
1	3	1.200000	30.000000	DVB-S2	2	No
2	0	11.900000	11.000000	DVB-S2	2	Yes

```
Satellite (DVB) Receiver Status
```



```
Rx State           : On
DVB State          : Forward Link up
Network            : 1326, Carrier-Class
Frequency          : 11.249986 GHz
Symbol Rate        : 24.499864 Msps
S2 ModCod          : 7 QPSK-3/4
Pilot              : On
Frame length       : Long frame

DVB S2 Mode        : CCM
Roll off           : 0.25
SNR                : 9.8 dB
Input Power        : -27 dBm
```

To enable the Forward Link:

```
dvb rx fwdlink <idx> -enable
```

Example:

```
# dvb rx fwdlink 1 -enable
# dvb rx show
```

Satellite (DVB) RX Configuration

```
-----
Auto start          : Enabled
RX watchdog         : 15 minute
```

Idx	Pri	SymbRate[Msps]	Freq[GHz]	Mode	PopId	Enable
* 0	2	24.500000	11.250000	DVB-S2	2	Yes
1	3	1.200000	30.000000	DVB-S2	2	Yes
2	0	11.900000	11.000000	DVB-S2	2	Yes

Satellite (DVB) Receiver Status

```
-----
Rx State           : On
DVB State          : Forward Link up
Network            : 1326, Carrier-Class
Frequency          : 11.249986 GHz
Symbol Rate        : 24.499864 Msps
S2 ModCod          : 7 QPSK-3/4
Pilot              : On
Frame length       : Long frame

DVB S2 Mode        : CCM
Roll off           : 0.25
SNR                : 9.5 dB
Input Power        : -27 dBm
```

9.3 Line-up

Perform antenna and ODU installation and alignment as described in Appendix F and the initial parameter configuration described in section 9.2 before proceeding with the procedures described here.

9.3.1 Forward Link Acquisition

Connect the RX cable between the ODU and IDU (if not already connected). Verify that the RX power level is between -25 dBm and -65 dBm at the input of the IDU.



If the antenna, ODU, and Forward Link parameters have been set correctly (see section 9.2.1 - Antenna and ODU Parameter Configuration, and section 9.2.3 - Forward Link Parameters) and the IDU RX power level is as specified above, the VSAT is ready to acquire the Forward Link:

1. If not already logged on, start the VSAT and login as `installer` (user = `install`, factory default password = `dvbrcs`) after having seen the message `Starting DVB interface`.
2. Enter the CLI command `dvb rx start` to acquire the Forward Link.
3. The CLI message `Forward Link up` is displayed on the CLI output after successful acquisition of the Forward Link.

The reader is referred to Appendix O for a description of the steps performed by the SatLink VSAT when acquiring the Forward Link.

If the VSAT reports that RX tuning failed please check the following:

- ODU parameter setting – section 9.2.1
- Forward Link parameter setting – section 9.2.3
- That the RX cable is properly connected to both the VSAT and the LNB
- That the signal level in to the IDU is between -25 dBm and -65 dBm
- That the antenna/ODU has been properly aligned (both antenna pointing and polarization adjustment correct)

To ensure good performance (less than one error event at MPEG2-TS level per hour) for the Forward Link, the SNR value, reported using the `dvb rx show` command, shall be verified to be at a minimum level before line-up is completed. If, after repeated antenna/ODU alignment, the minimum SNR value is not obtained, the system operator/service provider shall be contacted.

Non-rainy weather conditions will normally be required to obtain the minimum SNR value. If the minimum SNR value has been provided by the system operator/service provider, the reported SNR shall be verified against the provided value. If the minimum SNR value has not been provided by the network operator, the minimum SNR value is found as follows:

For DVB-S2 CCM operation:

The minimum SNR value is specified in Table 12. However, this table does not account for any required link margin to compensate rain fade attenuation.

For DVB-S2 ACM operation:

Check with the system operator/service provider what is the expected maximum MODCOD to be received at each specific VSAT site and use Table 12 to find out what the minimum SNR is for that MODCOD. The SNR values shown in Table 12 are valid for normal frames (64 kbit); for short frames (16 kbit) add 0.2 dB to obtain the required minimum SNR.

Please keep in mind the following two facts:

1. The maximum MODCOD would be accomplished only during clear sky conditions
2. The maximum achievable MODCOD can change from site to site due to differences in downlink EIRP (satellite coverage) and VSAT antenna size.



Mode	Modulation	FEC Code Rate	STM Recommended SNR (E_s/N_0)
DVB-S2	QPSK	1/4	-0.3 dB
DVB-S2	QPSK	1/3	-0.1 dB
DVB-S2	QPSK	2/5	0.2 dB
DVB-S2	QPSK	1/2	1.2 dB
DVB-S2	QPSK	3/5	2.4 dB
DVB-S2	QPSK	2/3	3.2 dB
DVB-S2	QPSK	3/4	4.2 dB
DVB-S2	QPSK	4/5	4.9 dB
DVB-S2	QPSK	5/6	5.4 dB
DVB-S2	QPSK	8/9	6.4 dB
DVB-S2	QPSK	9/10	6.7 dB
DVB-S2	8PSK	3/5	6.0 dB
DVB-S2	8PSK	2/3	7.0 dB
DVB-S2	8PSK	3/4	8.4 dB
DVB-S2	8PSK	5/6	9.8 dB
DVB-S2	8PSK	8/9	11.2 dB
DVB-S2	8PSK	9/10	11.6 dB
DVB-S2	16APSK	2/3	10.0 dB
DVB-S2	16APSK	3/4	11.2 dB
DVB-S2	16APSK	4/5	12.0 dB
DVB-S2	16APSK	5/6	12.6 dB
DVB-S2	16APSK	8/9	13.9 dB
DVB-S2	16APSK	9/10	14.1 dB

Table 12: Required Forward Link SNR values for DVB-S2 Mode

For DVB-S operation:

The minimum SNR value is specified in Table 13 below. However, this table does not account for any required link margin to compensate rain fade attenuation.

Mode	Modulation	FEC Code Rate	Required Forward Link SNR (E_{bc}/N_0) for achieving less than one error event per hour
DVB-S	QPSK	1/2	1.5 dB
DVB-S	QPSK	2/3	3.2 dB
DVB-S	QPSK	3/4	4.3 dB
DVB-S	QPSK	5/6	5.2 dB
DVB-S	QPSK	7/8	6.1 dB

Table 13: Required Forward Link SNR values for DVB-S Mode

9.3.2 TX Power Calibration

This section describes how to calibrate the TX output power when using the SatLink 4033/4035 transceiver. See Appendix I for a description of how to perform TX power calibration for other transmitters (BUCs).

TX power level calibration and Return Link acquisition shall only be performed if the Forward Link has been acquired and is operating properly.



1. Ensure that the VSAT configuration procedure in section 9.2 has been performed.
2. Ensure that the VSAT receiver is started and the Forward Link is acquired:
 - Check that the receiver is running by issuing the CLI command `dvb rx show`. If the receiver is not turned on, start the receiver by issuing the CLI command `dvb rx start`.
 - Check that the Forward Link has been acquired by verifying that the CLI message `Forward Link up` is displayed on the CLI output.
3. Ensure that the VSAT transmitter is turned off:
 - Enter the CLI command `dvb tx show`. Verify that the transmitter is `Off`. If the transmitter is `On`, use the command `dvb tx logoff` to turn the transmitter off.
4. Ensure that the TX cable from the VSAT to the ODU is connected.
5. Use the CLI command `dvb tx eirp <level>` to configure the transmit EIRP level. The VSAT can either be configured to transmit at maximum level (operating at the P1dB compression point) using the command `dvb tx eirp max` or, alternatively, the desired EIRP level can be set to a given level for use in a system where the power level received at the satellite is aligned for all VSATs. The factory default configuration is to transmit at the P1dB compression point.

Example:

```
dvb tx eirp 42      sets the output to 42 dBW.
dvb tx eirp max     selects maximum output power.
```

Save the configuration by using the CLI command `save config`.

6. Verify the transmitter configuration using the CLI command `dvb tx show`.

Example:

```
# dvb tx show

Satellite (DVB) TX Configuration
-----
Auto start           : Disabled
IDU output power     : -15 dBm
IDU max output power : 0.0 dBm
EIRP                 : max
Default CW Frequency: 14.488000 GHz
ATM mode             : VC-Mux
Header Compression   : RTP/UDP/IP/DSM-CC

DVB Transmitter Status
-----
State                : Off
#
```

The CW frequency to use for measurements during the calibration procedure is obtained from the service provider or satellite operator.

7. Contact the satellite operator / control center to clarify the line-up procedures for transmission power calibration and fine adjustment and verification of polarization of the VSAT.



8. Have contact by phone with the control center when performing the following measurements.
9. Issue the CLI command `dvb tx calibrate` to start the automatic transmitter power calibration routine. During this calibration, the transmit EIRP level is detected and the IDU output level is automatically adjusted to the level required for transmitting with the configured EIRP level. Hence, no manual configuration of the IDU output power level or cable attenuation is required.



Ask the control center if they can detect the transmitted CW. If they are not able to see the CW at the specified frequency and expected output power level, please power off the VSAT immediately.

Example:

```
# dvb tx calibrate
Using preconfigured CW frequency 14.488000 GHz
RF Wanted= 34.5, RF Measured= 20.8, If output= -29.2
RF Wanted= 34.5, RF Measured= 22.2, If output= -28.2
RF Wanted= 34.5, RF Measured= 24.8, If output= -26.2
RF Wanted= 34.5, RF Measured= 25.6, If output= -25.2
RF Wanted= 34.5, RF Measured= 27.9, If output= -23.2
RF Wanted= 34.5, RF Measured= 30.1, If output= -21.2
RF Wanted= 34.5, RF Measured= 31.1, If output= -20.7
RF Wanted= 34.5, RF Measured= 32.8, If output= -19.2
RF Wanted= 34.5, RF Measured= 33.2, If output= -19.2
RF Wanted= 34.5, RF Measured= 33.7, If output= -18.7
ODU output level stabilized
Note: CW transmission is still enabled to allow
      for cross polarization adjustment of the antenna
Saving Configuration. This will take ~20 secs
Configuration Saved
#
```

10. Verify the calibrated power levels using the CLI command `dvb tx show`.

Example:

```
dvb tx show

Satellite (DVB) TX Configuration
-----
Auto start           : Enabled
IDU output power     : -15 dBm
IDU max output power : 0.0 dBm
EIRP                 : max
Default CW Frequency: 14.488000 GHz
ATM mode             : VC-Mux
Header Compression   : RTP/UDP/IP/DSM-CC

Satellite (DVB) Transmitter Status
-----
State                : On (TDMA)

IDU Output Power     : -23.1 dBm
ODU Output Power     : 34.9 dBm
EIRP                 : 46.1 dBW
Es/No                : 9.5 dB
```



```
Header Compression : UDP/IP/DSM-CCTiming correction : -39 us (263629 us)
Frequency correction: -900 Hz
#
```

The CW will now be left on for 20 minutes to enable fine adjustment of the antenna. To turn off CW transmission, use the CLI command `dvb tx cw off`.

9.3.3 Fine Adjustment of Antenna Pointing

If the CW from the power calibration routine is still on, it can be used for fine-adjustment of the antenna as well. Otherwise, start CW transmission on the default CW frequency by issuing the CLI command `dvb tx cw on`.



Ask the control center if they are measuring the expected power level for the CW. If not, it is likely that the antenna pointing is not optimal. Fine-adjust the antenna pointing until the CW power level detected by the control center is within their requirements.

9.3.4 Fine Adjustment of Antenna Polarization

Ask the control center if the measured level of the CW on the cross-polar transponder is below their requirement. If not, adjust the rotation angle of the RX/TX/Feed Assembly with respect to the feed horn until the polarization discrimination is within specified limits.

9.4 Test of Connection to the Hub

After the line-up procedure in section 9.3 (or alternatively, Appendix I.1) has been successfully completed, the VSAT is ready to log on to the Hub.

The VSAT is only allowed to log on to the network if its DVB MAC address is registered at the Hub. Registration of the VSAT's MAC address at the Hub is a network operator responsibility. The CLI command `device show` can be used to display the DVB MAC address of the VSAT or it can be found on the label underneath the VSAT chassis. The MAC address is also shown on the CLI message display during the boot procedure of the VSAT.

Example:

```
# device show
```

System Information:

```
Name           : --TEST42-SL1000S3--
Location        : UAE
Contact         : STMEA
System Up time  : 0 days, 00:28:11
CPU Load        : 10%
System time(UTC): 23 February 2009 08:30:31
Broadcast Message : not set
```

HW:

```
Model           : SatLink 1000
HW ID           : 103346
Main board ID   : 120012 R1.2
```

MAC addresses:

```
Ethernet (LAN)  : 00:20:0e:10:17:15
Satellite (DVB) : 00:20:0e:10:17:15
```



Then do the following:

1. If the receiver is not already on, enter the CLI command `dvb rx start` to acquire the Forward Link. The VSAT has successfully locked to the Forward Link when the message `Forward Link up` is displayed.
2. Enter the CLI command `dvb tx logon` to start the transmitter and log on to the DVB-RCS network. If successfully logged on, an output similar to the example below is written to the Telnet/HyperTerminal window. Use the CLI command `dvb tx show` to show the transmitter status.
3. Example:
Initial Synchronization:
Forward Link up
All tables acquired
Logging on...successful
Fine Synchronization...achieved
Return Link up
Two-way link established
4. To test the IP connection to the Hub, open an MS-DOS window on the PC connected to the VSAT LAN (Ethernet).
Type the MS-DOS command 'ping 10.10.10.4' to test the connection to the Hub router³.
If the router gives a positive reply to the ping message then the satellite link is successfully up and running.
5. To test the connection to the Internet, type the MS-DOS command 'ping www.stmi.com'. If a reply is received, the PC connected to the VSAT has a working connection to the Internet via the satellite network.

³ Replace the IP address 10.10.10.4 with the actual IP address of the Hub router if the default IP configuration of the Hub is not used.



9.5 Prepare the VSAT for Normal Operation

The connection to the Internet over the satellite network should now be tested and found to be working. The only thing left is then the final configuration to prepare the VSAT for normal operation.

The VSAT must be started and you must be logged in as a user with minimum privilege level 2 (e.g. `install user`) before completing the following operations.

1. Configure the VSAT to automatically start the receiver by typing the CLI command
`dvb rx autostart on.`

Setting the RX autostart to on will ensure that the receiver is started automatically after power failure, link failure, Hub restart, a software failure, etc., without needing user intervention.

Verify that auto start is on for the receiver by typing the CLI command `dvb rx show.`

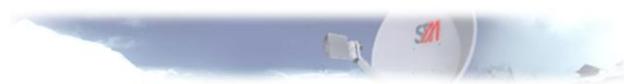
2. Configure the VSAT to automatically start the transmitter by typing the CLI command
`dvb tx autostart on.`

Setting the TX autostart to on will ensure that the transmitter is started automatically after, for example, a power failure, link failure, Hub restart, or a software failure, etc. without needing user intervention.

Or, alternatively, follow the procedure in section 13 if the VSAT shall use traffic-initiated log on.

Verify that auto start is on for the transmitter by typing the CLI command `dvb tx show.`

3. Save the configuration by typing the CLI command `save config.`



10. Network Address Translation (NAT)

Network Address Translation is a mechanism to provide transparent IP-level access to the Internet from a local site with a private address range without requiring all the hosts on the site to have globally valid IP addresses. NAT translates addresses in incoming and outgoing IP packets by replacing the source address in each outgoing IP packet with the globally valid IP address, and replacing the destination address in each incoming IP packet with the private address of the destination host on the local site.

Network Address Port Translation (NAPT), sometimes called Port-Mapped NAT, is a popular variant of NAT providing concurrency by translating TCP or UDP protocol port numbers as well as addresses.

The VSAT supports:

- Dynamic NAPT
- Static NAPT
- Static NAT

To enable Network Address Translation (NAPT or static NAT) in the VSAT, use the web interface or the CLI command `ip nat enable`. To show the status of the Network Address Port Translation in the VSAT, use the web-interface or the CLI command `ip nat show`.⁴ If the user has enabled NAT in the VSAT, then it is mandatory to set one global IP address for NAT—i.e., the NAT IP address. The CLI command `# ip nat global add <gladdr>` is used to configure the default global address. The following example shows how to configure a global IP address for NAT:

Example:

```
# ip nat global add 10.10.1.10
```

After setting up the global IP address for the NAT, check the NAT configuration by using the CLI command `ip nat show`

```
# ip nat show
```

NAT Configuration

Network Address Port Translation (NAPT): Enabled

Global Address Table

If	IP Address
dvb0	10.10.1.10

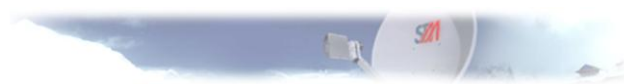
NAT Status

Total Sessions	0
Active Sessions	0
Failed Sessions	0
Packet Translations	0

10.1.1 Configuration of Dynamic NAPT

Dynamic NAPT applies for all LAN initiated connections that are to be routed over the DVB satellite interface. The source address of the outgoing packets will be replaced by the Global Address that is defined in the NAPT Global Address Table. Port numbers will be mapped to new port numbers that are automatically generated by the VSAT.

⁴ Please note that the CLI command `# ip nat enable` applies both for static NAT and NAPT, even though the `# ip nat show` status output only mentions NAPT enabled.



Note that it is required to define a dedicated global IP address to use NAPT. Using the DVB interface IP address as global IP address is no longer supported since Release 13.

The CLI command `# ip nat global add <gladdr>` is used to configure the default global address. Correspondingly, the user defined global address can be deleted using the CLI command `# ip nat global del <gladdr>`.



Though the CLI command `# ip nat global add <gladdr>` allows the user to define more than one global address, in practice, only the first address in the NAT Global Address table will be used.



Release 14 allows transparent routing for LAN IP address when static NAT is used without dynamic NAT.

Please note that translation of outbound TCP/UDP fragmented datagrams will fail with NAT enabled. The reason is that only the first fragment contains the TCP/UDP header that would be necessary to associate the packet to a session for translation purposes. Subsequent fragments do not contain TCP/UDP port information, but simply carry the same fragmentation identifier specified in the first fragment. Consequently, the sessions will be corrupted. Whether NAT drops or forwards ICMP fragmented packets depends on a number of things, such as the order in which the NAT router receives the ICMP fragments and the state of the translation table at that time. Under certain conditions, NAT translates the ICMP fragments differently, making it impossible for the destination device to reassemble the packet.

To view the currently configured dynamic NAPT entries, type the CLI command: `# ip nat show`.

Example:

```
# ip nat global add 10.10.1.10
# ip nat show
NAT Configuration
-----
Network Address Port Translation (NAPT): Enabled

Global Address Table
If      IP Address
dwb0    10.10.1.10

NAT Status
-----
Total Sessions           0
Active Sessions          0
Failed Sessions          0
Packet Translations      0
```

10.1.2 Configuration of Static NAPT

Static NAPT is used to map incoming connections to different local hosts dependent on their TCP/UDP port number.

When using static NAPT, both the IP addresses and port numbers of the incoming packets will be substituted with the IP addresses and port numbers that are defined using the CLI command:

```
# ip nat napt add <gladdr> <glport-first>[<port range>]<locaddr>
[<locport>] [<if>]
```



Multiple global address/port combinations can be mapped to the same local address/port.
 Static NAPT entries in the address translation table are removed by issuing the CLI command:
 # ip nat napt del <gladdr> <glport>

To view the currently configured static NAPT entries, type the CLI command: # ip nat show

Example:

```
# ip nat napt add 10.10.2.2 5000 192.168.0.12 3000
# ip nat show
NAT Configuration
-----
Network Address Port Translation (NAPT): Enabled

Global Address Table
If      IP Address
dwb0    10.10.1.10

Static NAPT Map
If      Global Address/Port-Start    Local Address/Port-Start PortRange
dwb0    10.10.2.2/5000                192.168.0.12/3000

NAT Status
-----
Total Sessions          0
Active Sessions         0
Failed Sessions         0
Packet Translations     0
```

10.1.3 Configuration of Static NAT

Static NAT provides two-way access to servers behind NAT. The destination IP address of the incoming packet is replaced by the corresponding local address that is configured in the Static NAT Map Table. Likewise, when the host device sends a packet towards the satellite network, the source IP address of the outgoing IP packet is replaced by the global address configured in the Static NAT Map Table.

The Static NAT MAP Table is configured using the following CLI command:

```
ip nat static add <globaddr> <locaddr>
```

Entries in the Static NAT MAP Table are deleted using:

```
ip nat static del <globaddr> <locaddr>
```

To view entries in the NAT tables, use ip nat show.



Example:

```
# ip nat static add 10.10.2.1 192.168.0.10
# ip nat show
NAT Configuration
-----
Network Address Port Translation (NAPT): Enabled

Global Address Table
If      IP Address
dwb0    10.10.1.10

Static NAT Map
If      Global Address      Local Address
dwb0    10.10.2.1            192.168.0.10

Static NAPT Map
If      Global Address/Port-Start  Local Address/Port-Start  PortRange
dwb0    10.10.2.2/5000             192.168.0.12/3000

NAT Status
-----
Total Sessions              0
Active Sessions             0
Failed Sessions             0
Packet Translations         0
```

It is also possible to add a range of ports to static NAPT and not just single ports.

```
# ip nat show
NAT Configuration
-----
Dynamic Network Address Port Translation (NAPT): Enabled

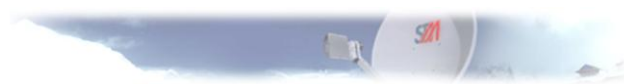
Global Address Table
If      IP Address
dwb0    88.84.83.129

Static NAPT Map
If      Global Address/Port-Start  Local Address/Port-Start  PortRange
dwb0    88.84.83.129/3311  12.12.12.12/1111  10

NAT Status
-----
Total Sessions              1964
Active Sessions             18
Failed Sessions             0
Packet Translations        169053
#
```



Release 14 allows transparent routing for LAN IP address when static NAT is used without dynamic NAPT.



11. Quality of Service

QoS is used to provide differentiated handling of different types of IP traffic. The aim is to be able to satisfy traffic flows for applications with different requirements, while at the same time minimizing the required bandwidth on the Return Link. For example, QoS is used to assure a given Return Link bandwidth with minimal delay jitter for VoIP or Video real time traffic by avoiding influence from traffic that is not so sensitive to delay jitter — e.g., web browsing and FTP.

The VSAT does QoS differentiation on the Return Link based on the DiffServ architecture and can work in networks that offer performance as per hop behavior (PHB) as defined in the DiffServ architecture. QoS on the Forward Link is handled by the DVB-RCS Hub alone, and not discussed further in this manual.

The VSAT supports use of the following PHBs and PHB groups on the Return Link⁵:

- Best Effort (BE) PHB
- Critical Data (CD) PHB
- Real Time Video Conferencing (RT-ViC) PHB group
- Real Time Voice over IP (RT-VoIP) PHB group

Internally, the VSAT classifies the traffic that shall be sent on the Return Link into different QoS groups. One or more QoS groups will then be mapped to a PHB / PHB group in the network. The VSAT internally supports the following QoS groups:

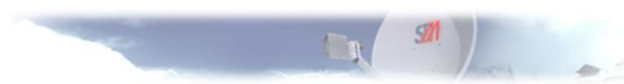
QoS Group ID	QoS Group Name	Maps to PHB
0	Best Effort	Best Effort (BE)
1	VoIP Audio	Real Time Voice over IP (RT-VoIP)
2	VoIP Signaling	Real Time Voice over IP (RT-VoIP)
3	ViC Video	Real Time Video Conferencing (RT-ViC)
4	ViC Audio	Real Time Video Conferencing (RT-ViC)
5	ViC Signaling	Real Time Video Conferencing (RT-ViC)
6	Critical Data	Critical Data (CD)

The QoS implementation in the VSAT is based on a multi-field classifier, i.e., the DSCP/TOS field and other fields in the IP header are used to classify which QoS group each IP packet belongs to. IP packets belonging to different QoS groups are then treated differently by the VSAT. The VSAT can be configured to support traffic differentiation based on DSCP values as used in DiffServ based networks.

Associated with each QoS group is a QoS policy. Parameters that impact the QoS policy are:

- Capacity request algorithm and parameters
 - The capacity request algorithms for real-time traffic are tailored to request a continuous rate capacity.
 - The capacity request algorithms for best effort and critical data are designed for more bursty and delay insensitive traffic such as Web browsing and FTP.
- Transmission PID or VPI/VCI
 - Used to give precedence to real-time traffic when interleaving traffic from different QoS groups at the MPEG/ATM level.
- Drop policy
 - Real-time traffic packets are dropped at the head of the transmission queue if the queue overflows, while best effort traffic packets are dropped at the tail of the queue.

⁵ Critical Data and Real Time Video Conferencing are only available on the STM SatLink 1000, 1900, 1901, 2000, and 2900 when the software license key for 4 QoS classes has been set (see section 18.3).



- The transmission queue lengths are tailored for each QoS class.
- Precedence
 - Real-time traffic is given precedence over best effort traffic.

Typing CLI command `# ip qos show` will output, among other information, the QoS Policy Table:

If having QOS-4 license installed in the VSAT:

QOS Policy Table

Grp	Cls	CrM	Pri	QLength	Drop	Timeout	Description
0	0	0	0	400000	0	120	Best Effort
1	1	1	1	15000	1	120	VoIP Audio
2	1	1	2	4000	1	120	VoIP Signaling
3	2	1	5	500000	1	120	VIC Video
4	2	1	4	50000	1	120	VIC Audio
5	2	1	3	10000	1	120	VIC Signaling
6	3	0	6	400000	0	120	Critical Data

If not having the QOS-4 license installed the output will be:

QOS Policy Table

Grp	Cls	CrM	Pri	QLength	Drop	Timeout	Description
0	0	0	0	400000	0	120	Best Effort
1	1	1	1	15000	1	120	VoIP Audio
2	1	1	2	4000	1	120	VoIP Signaling

The parameters in the QoS Policy Table are not user configurable.

11.1 Configuring QoS for the Return Link

In order to determine the QoS group an IP packet belongs to, the VSAT uses a multi-field classifier. This multi-field classifier is used to perform a look-up in a classification table for all IP packets that shall be transmitted on the Return Link. This table can store up to 15 different masks that the IP packets will be matched to.

The following parameters in the IP header can be used for doing the MFC classification:

- IP source address
- IP destination address
- DSCP / TOS
- Protocol type
- TCP/UDP source port number
- TCP/UDP destination port number

Additionally the Ethernet User Priority as per IEEE 802.1Q can be used for QoS classification. Refer to section 18.6 for more details on mapping the Ethernet User Priority to a Return Link QoS class.

The MFC in the VSAT can also be used to set the DSCP field in the IP header.

The format of the QoS module of the MFC table is:

SubIdx	Idx	Grp	Classification	Parms	HitCount
	0-255	0-6	1-65535		

The index parameter is used to uniquely identify an entry in the classification table and decides the order in which the classification table is searched. When an IP packet is to be classified, the classification table is searched from index 0 and upward. If a match is found, the search is stopped and the IP packet is thereafter handled with the QoS Group for this entry in the classification table. If a match is not found for an IP packet it will be treated as best effort traffic.



The QoS Groups available for internal use in the VSAT are:

QoS Group ID	QoS Group Name
0	Best Effort
1	VoIP Audio
2	VoIP Signaling
3	ViC Video
4	ViC Audio
5	ViC Signaling
6	Critical Data (CD)

In addition, the classification table can be configured to block traffic from being sent to the Return Link (see section 18.4).

Factory default configuration is that the QoS module of the classification table is empty, and all traffic is handled as Best Effort (QoS Group 0). A user with privilege rights 2 (user *install* or equivalent) can configure a QoS entry in the Classification table in the VSAT as explained below, but the use of QoS groups other than 0 can be inhibited by the network operator/service provider. Please contact the network operator/service provider for use of QoS group 1-6 for VoIP and Video real-time traffic and prioritized effort traffic (CD). Please note that QoS Groups 3-6 for Video and Critical Data will only be available on the SatLink 1000, 1900, 1901, 2000, and 2900 if the software license for 4 QoS classes is configured (see section 18.3).

The CLI command to be used to configure a QoS entry in the Classification table is `ip mfc mask <module id> <subindex> <index> <group> <list of tags>` with module ID set to 0 (QoS). This command has a variable length where one or more tags with different tag parameters can be set. The tags are the different IP header parameters that can be used for QoS classification:

Tag and Tags Parameters for CLI command	Function
<code>+src <ipaddr> <mask></code>	Define or modify IP source address and netmask
<code>-src</code>	Delete IP source address and netmask
<code>+dst <ipaddr> <mask></code>	Define or modify IP destination address and netmask
<code>-dst</code>	Delete IP destination address and netmask
<code>+ dscp <dscp-start> <dscp-stop></code>	Define or modify DSCP range
<code>-dscp</code>	Delete DSCP range
<code>+prot <n> <p1> ... <pn></code>	Define protocol value [0,255]. Up to 3 protocol values can be defined (n can be 1, 2, or 3).
<code>-prot</code>	Delete protocol values
<code>+sport <sport-start> <sport-stop></code>	Define TCP/UDP source port number range
<code>-sport</code>	Delete TCP/UDP source port number range
<code>+dport <dport-start> <dport-stop></code>	Define TCP/UDP destination port number range
<code>-dport</code>	Delete TCP/UDP destination port number range
<code>+dscpmark <dscp></code>	Define DSCP value to set in IP header
<code>-dscpmark</code>	Delete DSCP value to set in IP header — i.e., do not change the DSCP value
<code>-all</code>	All filter masks. Used to delete an entry.

To view the current QoS configuration, use the CLI command `ip qos show` or `ip mfc show`.



Examples:

To add an entry in the QoS classification table matching IP packets with DSCP range 10-15 and assign these to the VoIP Audio QoS Group:

```
# ip mfc mask 0 3 0 1 +dscp 10 15
```

To add an entry in the QoS classification table matching protocol type 7 and assign this to the VoIP Audio QoS Group:

```
# ip mfc mask 0 3 1 +prot 1 7
```

To add one more classification criteria for the same entry (e.g., destination address):

```
# ip mfc mask 0 3 1 +dst 10.10.22.0 255.255.255.0
```

To delete one classification criteria from an entry of the QoS classification table:

```
# ip mfc mask 0 3 1 -prot
```

To delete the whole entry from the QoS classification table:

```
# ip mfc mask 0 3 0 -all
```

To add a new entry for classifying VoIP Audio traffic:

```
# ip mfc mask 0 1 1 +src 10.10.10.1 255.255.255.255 +dscp 10 15
```

To add a new entry for classifying VoIP Signaling:

```
# ip mfc mask 0 4 2 +src 10.10.10.1 255.255.255.255
```

To view the current QoS configuration:

```
# ip qos show
QoS Policy Table
Grp Cls CrM Pri QLength Drop Timeout Description
  0   0   0   0   400000    0     120 Best Effort
  1   1   1   1    15000    1     120 VoIP Audio
  2   1   1   2     4000    1     120 VoIP Signaling
QoS Classification table
Idx Grp Classification Parm
 224.□.□.□ 1 IPSrc= 10.10.10.1/255.255.255.255
           DSCP = 10..15
  2   1 Protocols = 7
  4   2 IPSrc= 10.10.10.1/255.255.255.255
  5   0 match all
#
```

11.2 Configuring the VSAT for VoIP

There are two QoS alternatives for the VoIP PHB group:

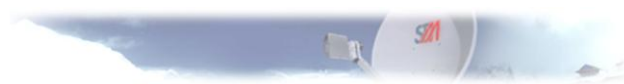
1. All VoIP traffic is mapped to QoS group 1
2. VoIP audio is mapped to QoS group 1 and VoIP signaling is mapped to QoS group 2

The second option will protect the VoIP signaling from fluctuations in the VoIP audio traffic. However, to use this option, the VSAT's QoS classification must be able to distinguish between VoIP signaling and VoIP audio in order to separate them into different QoS groups.

11.3 Configuring the VSAT for Video (ViC)

The following QoS alternatives are available for the ViC PHB group:

1. All ViC traffic is mapped to QoS group 3.
2. ViC video is mapped to QoS group 3 and ViC audio + signaling is mapped to QoS group 4.



3. ViC video is mapped to QoS group 3, ViC audio is mapped to QoS group 4 and ViC signaling is mapped to QoS group 5.

The second alternative has the advantage that the audio and the audio-signaling are protected from fluctuations in video traffic. The third alternative has the additional advantage of giving extra protection to the ViC signaling. However, to use option two and three, the VSAT's QoS classification must be able to distinguish between the video, audio, and signaling components of the ViC in order to separate them into different QoS groups.

11.4 DSCP and DiffServ

The following DSCP values are recommended to use on equipment connected to the VSAT:

Traffic	Recommended DSCP	Recommended QoS group
Best Effort	0 (000000)	0
Critical Data	26 (AF31; 011010)	6
ViC bulk	46 (EF; 101110) if VoIP is not in use 47 (101111) otherwise	3
ViC video	46 (EF; 101110) if VoIP is not in use 47 (101111) otherwise	3
ViC audio + signaling	39 (100111)	4
ViC audio	39 (100111)	4
ViC signaling	35 (100011)	5
VoIP bulk	46 (EF; 101110)	1
VoIP audio	46 (EF; 101110)	1
VoIP signaling	43 (101011)	2
Unconditional packet dropping	3 (000011)	n.a.

Recommended mapping to support standardized DiffServ compliance:

DSCP	Recommended QoS group	Comment
0 (000000)	0	Best effort
56 (111000)	6	Requires forwarding precedence
48 (110000)	6	Requires forwarding precedence
Other, not specifically treated	0	Best effort

Recommended mapping for support of the standardized AF PHB group, using AF class 3 as an example:

DSCP	Recommended QoS group	Comment
26 (AF31; 011010)	6	AF Class 3 low drop precedence
28 (AF32; 011100)	0	AF Class 3 medium drop precedence
30 (AF33; 011110)	0	AF Class 3 high drop precedence



Recommended mapping for support of the standardized EF PHB:

DSCP	Recommended QoS group	Comment
46 (EF; 101110)	1	This is an applicable mapping for constant rate real-time applications like VoIP
46 (EF; 101110)	3	This is an applicable mapping for variable rate real-time applications like ViC



12. Bandwidth on Demand

The SatLink System supports Bandwidth on Demand (BoD) based on the following modes:

- Rate-based BoD using low jitter assignments
- Volume-based BoD using immediate assignments, aiming at achieving good satellite resource efficiency
- A combination of the above two BoD modes, targeting a balance between good performance and good efficiency

These BoD modes use the DVB-RCS capacity request categories on the Return Link:

- Rate based (RBDC)
- Volume based (VBDC) / Absolute Volume Based (AVBDC)

Please refer to [5] for a detailed description of the Return Link capacity request categories.

As mentioned in section 11 the VSAT supports four PHB / PHB groups:

- Best Effort (BE) PHB
- Critical Data (CD) PHB
- Real Time Video Conferencing (RT-ViC) PHB group
- Real Time Voice over IP (RT-VoIP) PHB group

Default factory configuration of the VSAT is to use the Best Effort PHB for all Return Link traffic and utilize the Rate-based BoD mode. That is, the VSAT is pre-configured to request capacity from the NCC/Hub using the RBDC request category. Normally, the Hub or ISP will issue new Service Level Agreement parameters during the logon sequence and thus override the default settings.

The capacity requested by the VSAT and the capacity granted by the NCC to the VSAT on the Return Link can be viewed using the CLI command `dvb tx show -capacity`.

Example:

```
# dvb tx show -capacity
```

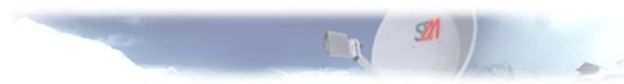
Capacity parameters per channel:

Channel	CRA[kbps]	Allocated[kbps]
0	0	156

Requested capacity per QoS class:

Channel	CRClass	MaxRBDC[kbps]	MaxVBDC[kB]	RateReq[kbps]	VolReq[octs]	Description
0	0	512	1000	138	0	Best Effort
0	1	128	0	0	0	VoIP
0	2	400	55	0	0	ViC
0	3	50	0	0	0	Critical Data

In the example above, the NCC has not assigned any continuous rate capacity (CRA) to the VSAT. The VSAT is authorized to request up to a maximum of 512 kbps Rate Based Dynamic capacity and to have a maximum of 977 Kbytes of outstanding not yet granted Volume/Absolute Volume Based Dynamic Capacity requested for the Best Effort PHB. Additionally, the VSAT is authorized to request Rate Based Dynamic Capacity for the VoIP PHB Group, a combination of Rate and Volume Based Dynamic Capacity for the ViC PHB group, and Rate Based Dynamic Capacity for the Critical Data PHB. In this example the VSAT requested 138 kbps of capacity and was granted by the Hub NCC a total of 156 kbps.



- **Channel:** All traffic in the current version of SatLink is transferred on the logical channel 0, which is the default logical channel from the VSAT to the satellite Hub.
- **CRA:** Allocated CRA capacity (DVB-RCS Continuous Rate Assignment capacity). The DVB-RCS Hub assigns CRA capacity to the VSAT at logon. Changes in the CRA level assigned to the VSAT during its log-on session are sent to the VSAT. The amount of CRA to be assigned to the VSAT is a network operator/service provider decision.
- **Allocated:** Allocated refers to the total aggregated amount of capacity (CRA + RBDC + VBDC/AVBDC + FCA) that the NCC has granted to the VSAT as a grand total for all QoS classes.
- **CRClass:** CRClass 0 represents BW demand for the BE PHB. CRClass 1, 2, and 3 represents BW demand for the VoIP PHB group, the ViC PHB group, and the VoIP PHB group, respectively.
- **MaxRBDC:** Maximum RBDC is the upper limit of Rate-Based Dynamic Capacity that a VSAT can request. The maxRBDC is set from the DVB-RCS Hub and is a network/service provider decision. The VSAT is pre-configured with a default value of maxRBDC for the Best Effort QoS class. This default value will be overwritten by the operator-defined value at logon.
- **MaxVBDC:** MaximumVBDC is the upper limit of not yet granted VBDC/AVBDC requested that a VSAT will have outstanding at any time. The maxVBDC is set from the DVB-RCS Hub and is a network/service provider decision. The default value of this parameter is 0. This default value will be overwritten by the operator-defined value at logon time.



13. Traffic Initiated Logon

The SatLink VSAT can be configured to log on automatically to the DVB-RCS Hub when it has traffic to send and logoff again when it has had no traffic to send for a configurable timeout period. This mode is useful for VSAT installations where low power consumption is important (e.g., when powered by solar power and batteries). It is also useful in systems where it is desirable to reduce the signaling bandwidth on the return channel (by avoiding use of dedicated SYNC slots when the VSAT has no traffic to send).

The power saving mode requires the use of the SatLink 403x transceiver. The power consumption will then be reduced from typically 27W to approximately 12W when the VSAT is logged off when using the SatLink 403x transceiver with SatLink 1000⁶.

The VSAT can be configured to use traffic initiated logon by typing the CLI command `dvb tx autostart traffic <timeout>`, where `<timeout>` is the timeout in minutes the VSAT will wait before logging off when it has no traffic to send.

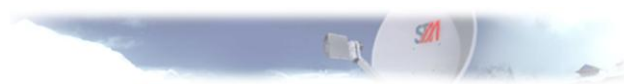
Example :

```
dvb tx autostart traffic 5
```

Configures the SatLink VSAT to use traffic-initiated logon and automatically log off the network after not having any traffic to send for 5 minutes.

Verify the configuration of the transmitter mode and the timeout for traffic-initiated logon by typing the CLI command `dvb tx show`.

⁶ When using the SatLink 4033 transmitter with the SatLink 1000, the power consumption will be reduced from typically 30W to approximately 12W when the terminal is logged off.



14. Header Compression

The header compression feature has been implemented into the SatLink system to reduce the required bandwidth, especially for VoIP calls. But there are also other application benefits with the Header Compression feature. Header compression greatly reduces the amount of overhead associated with each encapsulated IP packet. It is accomplished by removing (or reducing) redundant information in the packet headers at one or more layers.

There are two options when using header compression on the SatLink system. One is to enable header compression only for the DSM-CC header. The other option is to enable it for both DSM-CC and RTP/IP/UDP header.

14.1 Enabling Header Compression

The VSAT will detect whether the GW has the Header Compression enabled and only use the feature if it is available on the SatLink Hub. If the Header compression is enabled on the VSAT but not on the SatLink Hub, it does not take effect. The VSAT will then continue to transmit traffic as usual without header compression.

To check if header compression is an available feature on the SatLink Hub, connect to the CLI interface of the VSAT, enable DSM-CC and UDP Header Compression, and check the transmit status as shown in the example below.

```
# dvb hdrcomp +dsmcc
# dvb hdrcomp +udp
# dvb tx show
```

Satellite (DVB) TX Configuration

```
Auto start           : Enabled
IDU output power     : -15 dBm
IDU max output power : 0.0 dBm
EIRP                 : 46.0 dBW
Default CW Frequency : 0.000000 GHz
ATM mode             : VC-Mux
Header Compression   : RTP/UDP/IP/DSM-CC
```

Satellite (DVB) Transmitter Status

```
State                : On (TDMA)
IDU Output Power     : -15.2 dBm
ODU Output Power     : 32.7 dBm
EIRP                 : 42.4 dBW
Es/No                : 21.0 dB
Header Compression   : UDP/IP/DSM-CC
Timing correction    : 152 us (10623 us)
Frequency correction : -70 Hz
```

In this example, header compression is enabled on both the VSAT and the SatLink Hub. Always remember to save the new configuration with the command `save config`.



If the header compression is not available on the SatLink Hub, the `dvb tx show` command will display these values:

```
# dvb tx show
```

Satellite (DVB) TX Configuration

```
Auto start           : Enabled
IDU output power     : -15 dBm
IDU max output power: 0.0 dBm
EIRP                 : 46.0 dBW
Default CW Frequency : 0.000000 GHz
ATM mode             : VC-Mux
Header Compression   : RTP/UDP/IP/DSM-CC
```

Satellite (DVB) Transmitter Status

```
State                : On (TDMA)
Timeout              : 0 min 0 sec
IDU Output Power     : -15.2 dBm
ODU Output Power     : 33.0 dBm
EIRP                 : 46.3 dBW
Es/No                : 21.0 dB
Header Compression   : Disabled
Timing correction    : 152 us (10623 us)
Frequency correction : -70 Hz
```

14.2 Disable Header Compression

To disable header compression, use the same set of commands as used when it was enabled, but with a '-' instead of a '+'.

```
# dvb hdrcomp -dsmcc
# dvb hdrcomp -udp
# dvb tx show
```

Satellite (DVB) TX Configuration

```
Auto start           : Enabled
IDU output power     : -15 dBm
IDU max output power: 0.0 dBm
EIRP                 : 46.0 dBW
Default CW Frequency: 0.000000 GHz
ATM mode             : VC-Mux
Header Compression   : None
```

Satellite (DVB) Transmitter Status

```
State                : On (TDMA)
ODU Output Power     : 33.1 dBm
EIRP                 : 45.0 dBW
IDU Output Power     : -15.2 dBm
Es/No                : 24.0 dB
Header Compression   : Disabled
Timing correction    : 153 us (10623 us)
Frequency correction : -70 Hz
```



15. Routing of Multicast Traffic

The VSAT can be configured to route multicast traffic from the LAN to the return channel (to the Hub). User privilege level 2 is required for configuring the multicast routing.

To set up static routing of a multicast group from the LAN to the satellite interface, use the CLI command `ip addroute <IP group address> <subnet mask> <ifnum>`, where `IP group address` is the IP multicast address that shall be routed from the Ethernet LAN to the Hub, `subnet mask` is the net mask for this routing entry, and `ifnum` is the interface number (always set this to 3, which is for Satellite Interface).

Example:

```
# ip addroute 224.0.2.2 255.255.255.255 3
```

The command in the example will set up a route for the multicast group with the IP address 224.0.2.2 to the satellite interface (to the Hub). The MAC address used on the Return Link will be calculated according to RFC 1112.

To view the defined multicast routes, use the CLI command `ip show -mcast`.

Example:

```
# ip show -mcast
IP Multicast Routing Table
  RouteAddress      AddressMask  IfIndex
    224.0.0.2 255.255.255.255    1
    224.0.2.2 255.255.255.255    3
```



Subnetwork internal multicast groups on the LAN will show up in the multicast route table (e.g., LAN internal multicast traffic generated by Windows Network neighborhood, etc.). Such traffic will have the `IfIndex` set to 1.

To delete multicast routes, use the CLI command:

```
ip delroute <IP group address> <subnet mask> <ifnum>
```

Example:

```
# ip delroute 224.0.2.2 255.255.255.255 3
```

The above example will delete the static route of the multicast group with the IP address 224.0.2.2 from the Ethernet LAN to the satellite interface (Hub).

Enter the CLI command `save config` to save the Return Link multicast configuration.



16. Updating the VSAT SW

The flash in the VSAT can store two SW images, both the currently used SW and a backup version in case download of a new SW version fails.



Note that different VSAT models require different software images to be downloaded. Please make sure correct SW image / file name is used for given VSAT model as specified in the table below.

VSAT Model	HW revisions	Application SW file name
SatLink 1000	All	dvb-rs-X.Y.Z.B.tgz
SatLink 1910	All	dvb-rs-X.Y.Z.B.tgz
SatLink 2000	All	satlink-vs2-X.Y.Z.B.tgz
SatLink 2900	All	satlink-vs2-X.Y.Z.B.tgz

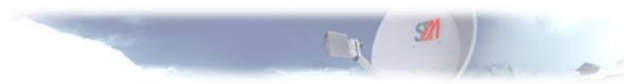
Table 14: Application SW filename to use for different VSAT models

“X.Y.Z” in the application SW file name is the actual release number, e.g. “14.0.0” and B is the build number for the SW release.



Always use the command `sw upgrade` as described in section 16.2 to manually upgrade the software version of a VSAT, since this command automatically deletes old backup software versions and backs up the current software and the configuration.

Do not use the CLI command `dlload` to upgrade the software of the VSAT, since failure to delete old backup software version may block future automatic software upgrades.



16.1 Automatic Software Update

The VSAT may be configured for receiving software updates from the SatLink Hub automatically. Whenever the software upgrade application at the SatLink Hub transmits a new software image, the software upgrade routine in the VSAT will start receiving the software image given that the new software image has a newer revision than the current software. When the software download is completed successfully, the VSAT will restart automatically in order to activate the new software version.

To automatically receive software upgrades, the VSAT must be configured with the PID, the multicast IP address, and the UDP port allocated by the system operator for multicast software upgrade, with software upgrade via multicast enabled, and with the VSAT receiver locked on the Forward Link. Issue the CLI command `sw show` to examine the automatic software upgrade configuration:

```
#
sw show

SW versions:
Boot           : 9.0.1.7
Current        : 13.0.2.65
Backup         : 13.0.2.61

Manual SW upgrade settings:
TFTP server IP addr : 10.10.1.1
File name           : new.tgz

Automatic SW upgrade settings:
Activated           : Yes
PID                 : 1022
IP address          : 224.0.1.59
Port No.            : 2001

Licenses for SW options:
NAT
GRE
PEP-TCP
QOS-4
PEP-HTTP
VLAN
```

Users with privilege level 2 may activate and deactivate the automatic software upgrade routine, and change the PID, IP address, and UDP port number where the software is received by using the CLI command `sw mcast`.

Example:

```
# sw mcast 1 511 224.0.1.59 2001
#
```

The above configuration will enable automatic reception of software upgrades on PID 511, IP address 224.0.1.59 and UDP port number 2001.



16.2 Manual Software Update

Users with minimum privilege level 2 may use the CLI command `sw upgrade` to download a new software image from the default TFTP server. After successful download of a new software image, the previous software version will be stored as a backup version before enabling the new software.

Described below in detail is the method to upgrade the VSAT software:

1. Verify the default settings for the manual software upgrade with the CLI command `sw show`.
2. If necessary, update the default settings for the manual software upgrade by using the CLI command `sw upgrade -default <upgraded-SW-filename> <tftp-ip-address>`
3. Verify the settings with the CLI command `sw show`
4. Execute the SW upgrade by typing `sw upgrade`, then restart the VSAT

How to upgrade the VSAT software manually on the SatLink 1000/1910

The following example displays how to upgrade the VSAT software manually on the SatLink 1000/1910.

Example:

```
#
SW versions:
Boot           : 9.0.1.7
Current        : 13.0.2.65
Backup         : 13.0.2.61

Manual SW upgrade settings:
TFTP server IP addr : 10.10.1.1
File name           : new.tgz

Automatic SW upgrade settings:
Activated           : Yes
PID                 : 1022
IP address          : 224.0.1.59
Port No.            : 2001

Licenses for SW options:
NAT
GRE
PEP-TCP
QOS-4
PEP-HTTP
VLAN

#

# sw upgrade dvb-rs-12.0.2.39.tgz 10.10.10.8

# sw upgrade
Software download in progress, please wait.....
.....
File Transfer complete
Configuration Saved
```

The VSAT then reboots automatically.

How to upgrade the VSAT software manually on the SatLink 2000 and SatLink 2900

The following example displays how to upgrade the VSAT software manually on the SatLink 2000/2900.



```
# sw show
```

```
SW versions:
```

```
    Boot           : 14.0.0.17
    Current        : 14.1.0.18
```

```
Manual SW upgrade settings:
```

```
    TFTP server IP addr : 10.10.1.1
    File name           : new.tgz
```

```
Automatic SW upgrade settings:
```

```
    Activated       : Yes
    Upgrade status   : Waiting

    PID             : 1411
    IP address       : 224.1.1.1
    Port No.        : 57001
```

```
Licenses for SW options:
```

```
    NAT
    GRE
    MOBILE
    PEP-TCP
    QOS-4
    RAC
    PEP-HTTP
    VLAN
```

```
# sw upgrade satlink-vsats2-14.1.0.19.tgz 10.10.14.8
```

```
Software download in progress, please
```

```
wait.....
```

```
.....Download complete
```

```
File Transfer complete
```

```
Configuration Saved
```

16.3 Restoring the Backup Software

If, for some reason, the old software must be restored, the following steps have to be executed. The current SW will be deleted when restoring the backup SW and the configuration used with the backup SW will be restored and activated.

1. Restore the previous SW and configuration with the command `sw restore`

Example:

```
# sw restore
```

```
Restoring backup SW 13.0.2.61
```

```
Current SW 13.0.2.65 will be deleted
```

```
Do you want to continue (Y/N)?y
```

```
Backup SW restored. Saving configuration and restarting
```

```
Saving Configuration. This will take ~20 secs
```

```
Configuration Saved
```

```
Restarting Terminal. Connection will be closed
```

```
Reconnect when the terminal has restarted (1-2 minutes)
```



17. SatLink and DVB-S2

The DVB-S2 standard has become the most widely used standard for Forward Link transmission in VSAT satellite communication systems. Advances in the field of digital coding and modulation techniques have made possible a technology upgrade of the legacy DVB-S standard. In the DVB-S2 standard, there are primarily four features that directly translate to improved performance:

- Higher order modulation
- Reduced carrier roll-off filtering
- Coding – LDPC-BCH with performance close to the Shannon limit
- Adaptive Coding and Modulation (ACM)

The following provides further information on the features of the DVB-S2 standard supported by the VSATs.

17.1 DVB-S2 Modulation

The SatLink IDUs support the following modulation schemes:

- QPSK
- 8PSK
- 16APSK

Figure 38 shows the modulation constellations for QPSK, 8PSK, and 16APSK. With QPSK, two FEC-coded bits are transmitted per modulation symbol, while with 8PSK and 16APSK three and four FEC-coded bits, respectively, are transmitted per modulation symbol.

DVB-S2 may be operated with three different roll-off factors for the pulse shaping filter: 0.35, 0.25, and 0.2.

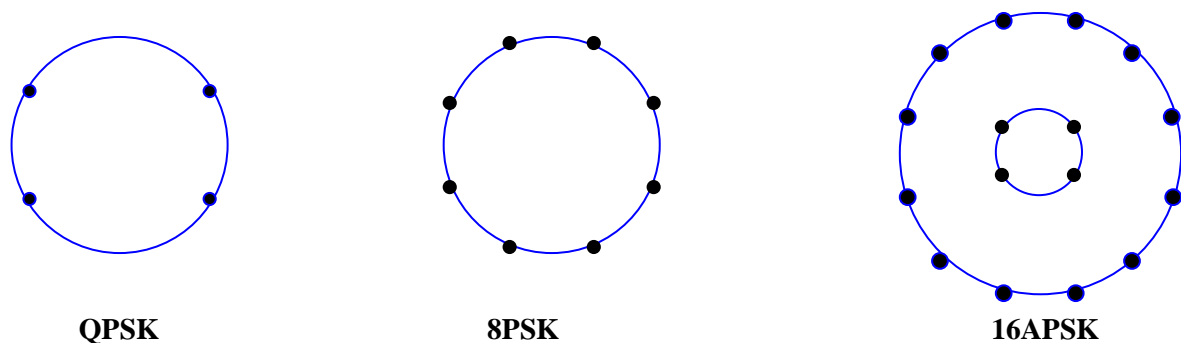


Figure 38: QPSK, 8PSK, and 16APSK Constellations

17.2 DVB-S2 Coding

DVB-S2 uses advanced LDPC code concatenated with outer BCH codes. This coding scheme results in a performance that is only 0.7-1.0 dB short of the theoretical Shannon bound indicated by the dotted red line in **Figure 39** below. This translates to an improvement in coding gain of close to 2 dB compared to DVB-S systems using concatenated Reed Solomon and Convolutional FEC.

DVB-S2 uses advanced LDPC codes concatenated with BCH codes. Together, these coding schemes result in a performance (indicated by the solid blue lines) that is only 0.7-1.0 dB from the theoretical Shannon limit (indicated by the dotted red lines); see **Figure 39** below. This translates to an improvement



in coding gain of close to around 2 dB in C/N compared to DVB-S (indicated by the solid black lines) at the same bandwidth efficiency and a 30% increase in bandwidth efficiency at the same C/N.

The code rate may be varied in small steps for each modulation, thus yielding both a high granularity and wide range of possible C/N-bandwidth efficiency operational points. The VSATs support the following combinations of Modulation and FEC rates in DVB-S2 mode, denoted MODCODs:

MODCOD	Modulation	FEC Code Rate
QPSK-1/4	QPSK	1/4
QPSK-1/3	QPSK	1/3
QPSK-2/5	QPSK	2/5
QPSK-1/2	QPSK	1/2
QPSK-3/5	QPSK	3/5
QPSK-3/5	QPSK	2/3
QPSK-3/4	QPSK	3/4
QPSK-4/5	QPSK	4/5
QPSK-5/6	QPSK	5/6
QPSK-8/9	QPSK	8/9
QPSK-9/10	QPSK	9/10
8PSK-3/5	8PSK	3/5
8PSK-2/3	8PSK	2/3
8PSK-3/4	8PSK	3/4
8PSK-5/6	8PSK	5/6
8PSK-8/9	8PSK	8/9
8PSK-9/10	8PSK	9/10
16APSK-2/3	16APSK	2/3
16APSK-3/4	16APSK	3/4
16APSK-4/5	16APSK	4/5
16APSK-5/6	16APSK	5/6
16APSK-8/9	16APSK	8/9
16APSK-9/10	16APSK	9/10

The SatLink IDUs support two options for FEC frame size: 64 kbits (normal frame) and 16 kbits (short frame). The LDPC+BCH codes are slightly more effective when used on the longer (normal) FEC frame; i.e., the required SNR is 0.2 dB lower for normal frame than for short frame. However, the short FEC frame is useful in several circumstances, such as reducing delay when the Forward Link information rate is low.

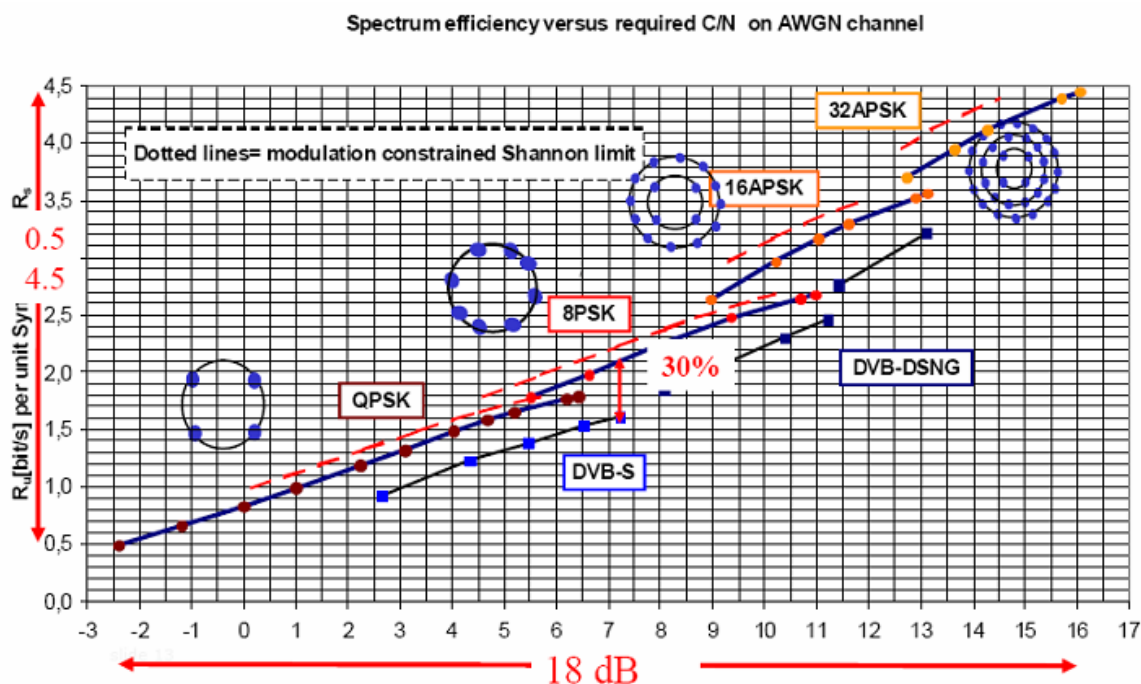


Figure 39: DVB-S2 Coding Performance

17.3 DVB-S2 Coding and Modulation Control Modes

Depending on the network configuration, the SatLink IDU may be operated with fixed, variable, or adaptive coding and modulation mode, denoted as CCM mode, VCM mode, and ACM mode, respectively. In CCM mode, the same code/modulation combination, denoted as MODCOD, is used all the time and for all VSATs. The MODCOD is determined through engineering by considering the system parameters (e.g., satellite EIRP, VSAT G/T, antenna sizes, coverage, etc.) and the environmental conditions in the region of the network, combined with link availability requirements, using standard link budget techniques. In VCM mode, a different coding and modulation may be used for different VSATs, for example, based on their geographic position in the beam, their availability requirement, and/or their antenna size.

In ACM mode, however, the MODCOD may be changed dynamically for each VSAT, from one FEC frame to the next. Hence, the applied MODCOD can be adapted to the near instantaneous and individual link conditions of each VSAT in order to maximize the attainable information rate per Hz of bandwidth for the network as a whole (i.e., aggregate bandwidth efficiency), while meeting required link availabilities across the network at all times.

In the SatLink system, this is accomplished by each VSAT constantly measuring its received signal-to-noise ratio (SNR) and reporting it periodically to the SatLink Hub. The Hub then uses the SNR value reported from each VSAT at a given time to select the suitable MODCOD for each. All signaling information is always transmitted at the lowest MODCOD with the best link margin in order to ensure that all VSATs are able to receive it.



17.4 DVB-S2 Configuration for 1910 IDUs with the SatLink 100 Plug-in Card

For operators that already have the DVB-S model of the SatLink 1910 IDU, a DVB-S2 upgrade path exists using the SatLink 100 plug-in card that is inserted into the expansion slot of the SatLink 1910. Units can be field-upgraded – there is no need to return units to STM for reconfiguration. The only requirement is that power is turned off when inserting the new extension card

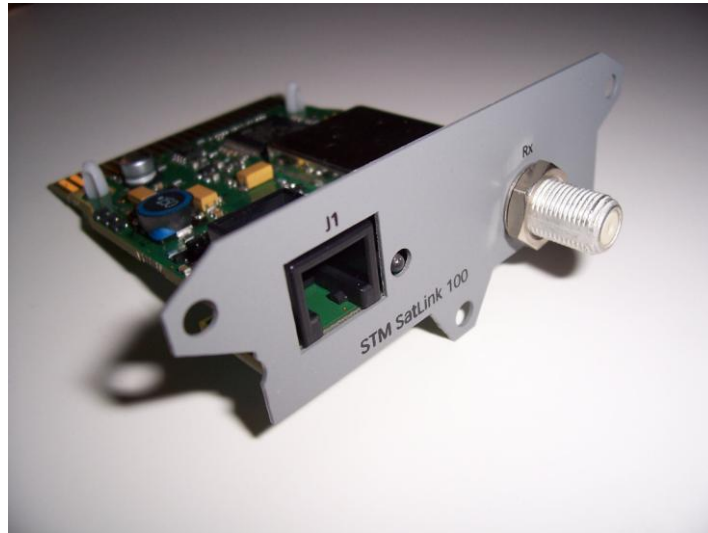


Figure 40: The SatLink 100 DVB-S2 Plug-in Card

To enable the SatLink 100 card on a SatLink 1910 IDU, in addition to moving the RX cable from the LNB to the RX connector on the SatLink 100 plug-in card, there is one CLI command required:

```
dvb rx phy -satlink100
```

Type the `device show` command to verify that the card has been detected. See the text in **bold**.

```
# device show
```

```
System Information
```

```
-----
Name           : not set
Location        : not set
Contact         : not set
System Up time  : 2 days, 23:57:20
Core temperature : 48.0 degrees C.
CPU Load        : 15%
System time     : not set, TDT not received
Broadcast Message : not set
```

```
HW
```

```
-----
Model           : SatLink 1910
HW ID           : 103798
Main board ID    : 103719 R6.5
```

```
Plugin-card HW
```

```
-----
Model           : SatLink 100
HW ID           : 107261
Revision        : 1.1
Serial Number    : 0206010006
```



MAC addresses

```
-----
Ethernet (LAN)      : 00:60:c0:2f:ba:83
Satellite (DVB)    : 00:60:c0:2f:ba:83
```

When the card has been detected by the VSAT, the DVB-S2 connection is configured the same as DVB-S, as described in section 9.2.3.

Example:

```
# dvb rx fwdlink 0 0 25000000 12380000 dvbs2 2
# save config
# dvb rx show
```

Satellite (DVB) RX Configuration

```
-----
Auto start          : Disabled

Idx  Pri  Freq[GHz]  SymbRate[Msps]  Mode  PopId
* 0    0   12.380000  25.000000      DVB-S2  2
```

DVB Receiver Status (SatLink 100)

```
-----
Rx State           : On
DVB State          : Forward Link up
Network            : 1326, STM Spain
Frequency          : 12.380887 GHz
Symbol Rate       : 24.999998 Msps
S2 ModCod          : 13 8PSK-2/3
Pilot              : On
Frame length       : Long frame
DVB S2 Mode        : CCM
Roll off           : 0.35
SNR                : 15.2 dB
```

For SatLink 1910 and 1000 having revision 2.0 or newer, there is no need for the SatLink 100 plug-in card, as they have built-in DVB-S2 receive capabilities as default. Both models are configured the same way as the example shows above.

If there is any doubt on whether a SatLink VSAT is capable of receiving DVB-S2, issue the CLI command `device show -dvbs2`.

Example:

```
# device show -dvbs2
DVB-S2 capability
This device supports DVB-S2 CCM and ACM.
```

```
HW revision
STV0900 receiver cut 2.0
```



18. Software Options

The VSAT supports the following features available as options, which require license authorization:

- GRE Tunneling (GRE)
- TCP/IP Performance Enhancing Proxy (PEP-TCP)
- HTTP acceleration (PEP-HTTP) – improved web browsing
- 4 QoS Classes (QOS-4) – Support for Video and Critical Data in addition to the two standard classes, Best Effort and VoIP.
 - This option is available as default on the SatLink 1910 and SatLink 2900.
- Return Link access control (RAC)
 - This option is available as default on the SatLink 1910 and SatLink 2900.
- Mobile VSAT (MOBILE)
 - This licensed option is available for the SatLink 1910 and SatLink 2900 only.
- VLAN extension and Ethernet user priority differentiation (VLAN) – support for VLAN (802.1Q) and Ethernet user priority differentiation (802.1p/D)
- DVB-S2 16-APSK (dvbs2-16APSK)

To show the list of the SW options that are authorized for use on the VSAT, use the CLI command `sw show`.

Example:

```
#
SW versions:
Boot           : 9.0.1.7
Current        : 13.0.2.65
Backup         : 13.0.2.61
```

```
Manual SW upgrade settings:
TFTP server IP addr : 10.10.1.1
File name           : new.tgz
```

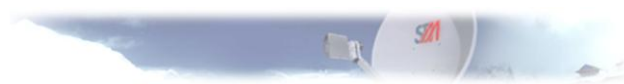
```
Automatic SW upgrade settings:
Activated           : Yes
PID                 : 1022
IP address          : 224.0.1.59
Port No.            : 2001
```

```
Licenses for SW options:
GRE
PEP-TCP
QOS-4
PEP-HTTP
VLAN
```

The licenses for optional SW functionality may be installed either remotely by the SatLink System Operator or locally using the CLI command `sw license`. Please contact the System Operator or ISP if access to a new software option is desired in order to receive a license key.

Example:

```
# sw license pep-tcp mykeyforenablingpeptcp
```



Once the right to use a SW option has been authorized by means of license installation, the SW functionality can be enabled using the appropriate CLI command (as explained in the following subsections).

Example:

```
# ip pep enable [redirect|trans|httpa]]
```



The CLI help function for the different SW options requiring licenses (e.g. ? ip pep) will not be available unless the SW option is authorized by installing the necessary license key.



SW options that are enabled on a model by default, like QOS-4 and RAC on the SatLink 1910, will not be displayed on the printout from the CLI command `sw show`.

18.1 Generic Routing Encapsulation (GRE) and IP Tunneling

The VSAT supports configuration of one IP tunnel from its DVB (Satellite) interface with Generic Routing Encapsulation (GRE) as specified in RFC 2784. Only the tunnel destination IP address and the subnet to be tunneled needs to be specified when setting up a GRE tunnel over the SatLink network, since the GRE tunnel by default will apply the reachable DVB interface IP address as the tunnel source IP address.

A GRE tunnel can also be used to extend a VLAN across the SatLink network. Please see section 18.5 for a description of how this is done.

Example:

```
#ip gre add 192.168.1.0 255.255.255.0 10.20.1.1
```

This will set up a GRE tunnel with the DVB interface IP address as the tunnel source and the IP address 10.20.1.1 as the tunnel destination. The GRE tunnel will accept traffic for the subnet 192.168.1.0/255.255.255.0.

To verify that a GRE tunnel and a GRE interface have been created, use the CLI command `ip gre show`.

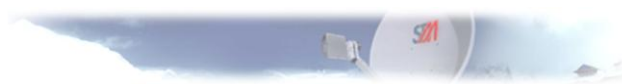
Example:

```
# ip gre show
```

GRE Tunnel Interfaces:

```
-----
If      Tunnel Local Address    Tunnel Remote Address
4              192.168.255.2      10.20.1.1
```

As shown above, interface number 4 has been allocated for the GRE interface. Use the CLI command `ip show` to verify that a new IP interface has been created and that two entries have been added to the IP routing table. One entry is used to route traffic with the destination address equal to the tunnel destination IP address to the DVB interface—e.g. the GRE tunnel packets themselves. Another entry is used to route traffic with destination addresses belonging to the GRE tunnel subnet into the GRE tunnel. Traffic arriving through the GRE tunnel is routed to the applicable interface.



```
# ip show
Interfaces
If      IPAddress      SubnetMask      BroadCastAddr    MTU      Alias
AdminStatus
1      10.20.42.1     255.255.255.0   10.20.42.255    1500     eth0      1
2      N/A           N/A             N/A             4074     air0      1
3      10.42.0.42    255.255.255.255 10.42.0.42      4074     dvb0      1
```

DNS Client Configuration

Primary DNS Server: 213.42.20.20, Secondary DNS Server:

Interface Statistics

```
----- Input -----
If      UCast      NUCast      Disc      Octets      UCast      NUCast      Disc      Octets
1      4867      8265      7091      936333      108      115      0      19901
2      0         0         0         0         0         0         0         0
3      768      0         0         72982      5622      0         0         422960
IP  Receive  Deliver  Errors  Discards  Forward  Request  NoRoute  Discards
      6386      1456      0         0         4930      894      0         4
```

Interface Directed Routing Table

In If Out If

Routing Table

```
DestMask      RouteMask      NextHop  If
0.0.0.0       0.0.0.0       0.0.0.0  3
10.20.42.0    255.255.255.0 0.0.0.0  1
10.42.0.42    255.255.255.255 0.0.0.0  3
```

To route unicast/multicast addresses specifically into a GRE tunnel, use the CLI command `ip addroute`.

Example

```
# ip addroute 225.0.0.2 255.255.255.255 4
```

The above configuration will forward multicast datagrams with IP address 225.0.0.2 from the VSAT LAN interface to the GRE tunnel identified by the specific GRE interface ID.



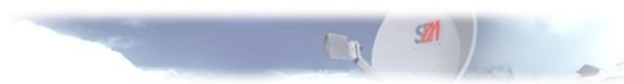
Forwarding of multicast IP traffic from a DVB interface to a GRE interface is not supported in the current release.

This is shown by the CLI command `ip show -mcast`:

```
# ip show -mcast
IP Multicast Routing Table
RouteAddress  AddressMask  IfIndex
225.0.0.2    255.255.255.255 4
239.255.255.250 255.255.255.255 1
```

18.2 TCP Performance Enhancing Proxy (PEP)

Conditions particular to satellite communication severely constrict the performance of TCP and reduce the end user's experience of accessing the Internet over satellite. Large latency, elevated bit error rates, and asymmetric bandwidth are all characteristics of satellite networks that result in degraded TCP performance. Various TCP Performance Enhancing techniques are used to improve the performance of the TCP protocol over satellite links. The TCP PEP implementation in the SatLink System makes use of a TCP Performance Enhancing Server installed in the SatLink Hub and a PEP software client embedded in the VSAT.



The VSAT embedded PEP client is an optional feature enabled by entering a license key. Use of the VSAT's embedded PEP client is subject to the Network Operator/ISP supporting the PEP functionality using a PEP server on the Hub side. It is possible for the Network Operator/ISP to activate the embedded client software remotely from the Hub, thus requiring no end-user intervention. Alternatively, an end-user can receive a license key from the Network Operator/ISP and activate the functionality using the CLI command `sw license` as shown in the example below.

Example:

```
# sw license pep mykeyforenablingpep
```

The PEP server in the Hub may be installed in two different modes.

1. Re-direct mode
2. Transparent mode

Re-direct mode is the default setting. The Network Operator/ISP should inform you if the Hub PEP server is installed in transparent instead of re-direct mode.

When operating in re-direct mode, the IP address of the TCP PEP Server in the Hub must be configured in the VSAT. If the VSAT is authorized to use PEP, this is normally performed remotely by the SatLink Hub when the VSAT logs on to the network. Alternatively, the VSAT user can locally configure the server address by means of the CLI command `ip pep server <ipaddr>` using the PEP Server IP address provided by the Network Operator/ISP.

To enable the PEP functionality, use the CLI command `ip pep enable [<mode>]`, where `<mode>` can assume the values `redirect` or `trans`. To verify that the PEP functionality has been enabled, type `ip pep show`.

The CLI command sequence to configure and enable the PEP functionality is shown below:

Example:

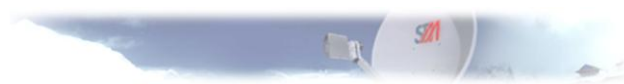
```
# sw license pep-tcp mykeyforenablingpep
# ip pep server 10.0.0.10
# ip pep enable redirect
# ip pep show                                     (to verify that the functionality is enabled)
PEP Status                                     : enabled
PEP TCP Mode                                   : Redirect Mode
PEP TCP Server Address                         : 137.133.81.40
Func    Max    Total    Current    Transp    Failed
TCP    2050    201072    58        0        0
```

TCP Packet statistics:

```
Rx=2356104, Out of seq=5341, Duplicates=767
Tx=1959173, Retransmitted=3937
```

The CLI command `ip pep show` displays current PEP configuration in addition to PEP status information. Table 15: provides a short description of the displayed parameters.

Parameters	Description
PEP status	Indicates whether the PEP functionality in the VSAT is enabled or disabled.
PEP Mode	Indicates whether the VSAT is configured in Redirect or Transparent Mode
PEP ServerAddress	Shows that IP address of the Hub PEP Server that the VSAT PEP client is configured to interact with.



Parameters	Description
Maximum Connections	Shows the maximum number of TCP connections that the VSAT PEP client can handle simultaneously.
Current Connections	Indicates the number of TCP connections that is handled by the VSAT PEP client at the moment.
Total Connections	Indicates the total number of TCP connections that has been handled by the PEP client since the PEP functionality was enabled.
Trans Connections	Once the number of connections exceeds the threshold Maximum Connections (i.e., 250 connections), the additional new connections are established without performance enhancement techniques being applied to these. The parameter Trans Connections indicates the number of connections that are passed “transparently” through the VSAT without PEP due to the Maximum Connection threshold being exceeded.
Failed Connections	Indicates the number of connections that were attempted established, but did not succeed.

Table 15: Parameters Displayed When Typing `ip pep show`

18.3 HTTP Acceleration (HTTPA)

HTTP acceleration (HTTPA) can be enabled in the SatLink 2900, 2000, 1910, and 1000 Revision 2.x. HTTPA is an embedded Intercepting Proxy Cache (IPC) that pre-fetches objects found by reference in accessed web pages. The internal VSAT DNS server is used to resolve the URLs. Pre-fetching speeds up web browsing over the satellite link through the use of parallel connections to several servers. HTTPA does, to some extent, cache objects to reduce response time. This is especially useful in a multi-user environment.

HTTPA generally improves the user experience when rendering web pages over the satellite link. Note that the improvement may differ significantly between web pages, as these typically have different sizes, complexities and structures. If an object requested by the HTTP client is found in the SatLink VSAT’s internal web-cache, the object will be delivered immediately.

When the VSAT is licensed to support HTTP acceleration, the function can be enabled and disabled. By default, the HTTP accelerator is disabled. HTTP acceleration operates in the context of TCP acceleration. When enabling HTTP acceleration, TCP acceleration is also enabled in the currently configured TCP acceleration mode; see section 18.2.

To enable HTTPA:

```
# ip pep enable httpa
```

To disable HTTPA:

```
# ip pep disable httpa
```



To check HTTPPA status:

```
# ip pep show

PEP Status           : enabled
PEP TCP Mode         : Redirect Mode + HTTPPA
Multiplexing         : disabled
Decompression        : disabled
Prefetching          : disabled
HTTP Concurrent Conxs : 0
-Max Concurrent Conxs : 200
PEP TCP Server Address: 10.10.22.254
Func   Max      Total  Current  Transp   Failed
TCP    512      0      0        0      0
HPS    60       0      0        0      0
HPC    60       0      0        0      0
WCM    100      0      0        0      N/A
TCP Packet statistics:
  Rx=0, Out of seq=0, Duplicates=0
  Tx=0, Retransmitted=0
Web Cache Statistics:
  Req=0 Prefetch=0 Hits=0 Exp=0 Reval=0 Miss=0 Fail=0
  DPTHit=0 DPTMiss=0
```

The 'PEP TCP Mode' here indicates that HTTPPA is enabled in addition to the specific PEP TCP mode in use. The 'TCP' function statistics indicate connection data for the TCP PEP. An intercepted TCP connection appears as two connections in the 'TCP' connection statistics.

The 'HPS' function statistics indicate connection statistics for the side of the HTTPPA that interfaces the web client called the HTTP Proxy Server. The 'HPC' function statistics indicate connection statistics for the side of the HTTPPA that interfaces the web client called the HTTP Proxy Client. The 'WCM' function statistics indicate object cache statistics from the Web Cache Manager. 'DPT' information is not essential.

When HTTPPA is activated, the VSAT IPC holds a local cache in the same manner as a standard web browser. The VSAT cache can be inspected and managed in much the same way as a standard browser cache, through the CLI:

Display a list of the VSAT IPC cached content:

```
# ip pep show -cache
```

Flush the VSAT IPC cached content:

```
# ip pep flush -cache
```

The VSAT IPC has integrated bypass mechanisms that prevent and limit failure of non-conforming use of the HTTP port and the HTTP protocol. The IPC can be completely bypassed so that all TCP communication goes directly between the HTTP client and the HTTP server, allowing non-conforming schemes to work properly. Domains that are known in advance to be non-conforming can be entered in a domain bypass list, and some domains that are known to be notoriously non-conforming are preconfigured and inserted in the domain bypass list at boot time. The list is used to populate a dynamic list of server addresses subject to IPC bypass through address resolution via the VSAT DNS. Server addresses that are associated with unsupported mechanisms are automatically added to the dynamic server bypass list, allowing succeeding access to work properly.



Display a list of the permanently bypassed domains:

```
# ip pep bypass -show
```

Add a domain to the list of permanently bypassed domains (e.g. www.nowhere.com):

```
# ip pep bypass -add <domain name>
```

Remove an added domain from the list of permanently bypassed domains:

```
# ip pep bypass -del <domain name>
```

Force a refresh of the address resolution of domain names:

```
# (not in the list when typing "? ip pep")
```

Clear current list of statically bypassed domain names:

```
# (not visible when typing ? ip pep dynbypass in VSAT CLI sw 14.1.0.48)
```

Show statistics and configuration of the dynamic server address bypass:

```
# ip pep dynbypass -show
```

Display a list of the server addresses currently being bypassed by the VSAT IPC:

```
# ip pep dynbypass -detail
```

Add a server IP address to the dynamic server address bypass list:

```
# ip pep dynbypass -add <A.B.C.D>
```

Remove a server IP address from the dynamic server address bypass list:

```
# ip pep dynbypass -del <A.B.C.D>
```

Adjust the server address bypass lifetime:

```
# ip pep dynbypass -lifetime <seconds>
```

The default lifetime is 4 hours.

The HTTP server bypass learning method set can be adjusted by toggling the specific controls as follows:

```
# ip pep dynbypass -learnpipeline  
- controlling bypass decision when server is accessed by pipelining
```

```
# ip pep dynbypass -learnnotfound  
- controlling bypass decision when server responds with HTTP 404 Not Found
```

```
# ip pep dynbypass -learnillegalreq  
- controlling bypass decision when server is accessed by an illegal request
```

```
# ip pep dynbypass -learnall  
- switches on all learning methods
```



```
# ip pep dynbypass -learnnone
- switches off all learning methods
```

```
# ip pep dynbypass -learnupload
# ip pep dynbypass -learnlongurl
# ip pep dynbypass -learnngwtimeout# ip pep dynbypass -learnmuxfail
# ip pep dynbypass -flush
```

Four QoS Classes

The Quality of Service functionality of the VSAT is described in detail in section 11. The Best Effort PHB and Real Time Voice over IP (RT-VoIP) PHB group are available on all VSAT models (provided the DVB-RCS Hub the VSAT is connected to supports these PHBs).

The Critical Data PHB and Real Time Video Conferencing PHB group are available as standard only on the SatLink 1910 and require the QoS4 SW license key to be configured on the SatLink 2000, 1000, 1900, 1901, and 2900 models. The table below shows which QoS Groups on which VSAT models require the QoS4 SW license key to be configured.

QoS Group ID	QoS Group Name	PHB	SW License key required					
			SatLink 2000	SatLink 1000	SatLink 1900	SatLink 1901	SatLink 1910	SatLink 2900
0	Best Effort	BE		-	-	-	-	-
1	VoIP Audio	RT-VoIP		-	-	-	-	-
2	VoIP Signaling	RT-VoIP		-	-	-	-	-
3	ViC Video	RT-ViC	QoS4	QoS4	QoS4	QoS4	-	QoS4
4	ViC Audio	RT-ViC	QoS4	QoS4	QoS4	QoS4	-	QoS4
5	ViC Signaling	RT-ViC	QoS4	QoS4	QoS4	QoS4	-	QoS4
6	Critical Data	CD	QoS4	QoS4	QoS4	QoS4	-	QoS4

Table 16: QoS Groups and Licenses for SatLink VSATs

18.4 Return Link Access Control (RAC)

The multi-field classifier of the VSAT can also be used to block undesired traffic from being forwarded onto the Return Link. By mapping the Return Link traffic to the QoS group having index -1, the VSAT can drop traffic destined to the Return Link based on the following parameters in the IP header:

- IP source address
- IP destination address
- DSCP / TOS
- Protocol type
- TCP/UDP source port number
- TCP/UDP destination port number

Use the CLI command `ip mfc mask <module id> [<subindex>] <index> <group> {{+|-}}<tag> <tag-parms>` to add RAC entries into the QoS Classification table. See section 11.1 for information on how this command is used for classifying Return Link traffic into different QoS classes. The command has a variable length where one or more tags with different tag parameters can be set. The



tags are the different IP header parameters that can be used by the multi-field classifier to identify traffic that shall be blocked.

Tag and tag parameters for the CLI	Function
+src <ipaddr> <mask>	Define or modify IP source address and netmask
-src	Delete IP source address and netmask
+dst <ipaddr> <mask>	Define or modify IP destination address and netmask
-dst	Delete IP destination address and netmask
+dscp <min> <max>	Define or modify DSCP range
-dscp	delete DSCP range
+prot <n> <p1> ... <pn>	Define protocol value [0,255]. Up to 3 protocol values can be defined (n can be 1, 2, or 3).
-prot	Delete protocol values
+sport <min> <max>	Define TCP/UDP source port number range
-sport	Delete TCP/UDP source port number range
+dport <min> <max>	Define TCP/UDP destination port number range
-dport	Delete TCP/UDP destination port number range

Table 17: Tags and Tag Parameters for the CLI

Examples:

To deny one IP address to access the Return Link:

```
# ip mfc mask 0 3 0 -1 +src 10.10.10.10 255.255.255.255
```

To block transmission to a certain TCP/UDP port range:

```
# ip mfc mask 0 3 0 -1 +dport 2000 3000
```

To delete the whole entry from the QoS classification table:

```
# ip mfc mask 0 3 0 -all
```

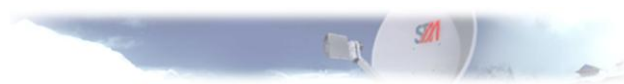
To view the current QoS configuration:

```
# ip qos show
QoS Policy Table
Grp Cls CrM Pri QLength Drop Timeout Description
  0   0   0   0  400000   0    120 Best Effort
  1   1   1   1   15000   1    120 VoIP Audio
  2   1   1   2    4000   1    120 VoIP Signaling
QoS Classification table
Idx Grp Classification Parm
11  -1 Dst port = 2000..3000
#

Or
#

ip mfc show
MfC Classification table
Module: QoS (0)
SubIdx Idx Grp Classification Parm HitCount
  3      0  -1 IPSrc= 10.10.10.10/255.255.255.255 0

Module: PEP (1)
SubIdx Idx Grp Classification Parm HitCount
  1    10   1 Dst port = 1..65535 0
```



With a RAC license you get access to two new commands:

```
ip lac rfp enable|disable
```

Detect and stops packets that have not a valid IP source address in any subnet that can be reached on the incoming interface.

```
ip lac srceqdest enable|disable
```

Detects and stops packets to the Return Link with src IP = dest IP.

18.5 VLAN Extension (802.1Q)

IEEE Std 802.1Q defines an Ethernet frame format that can be used to separate virtual VLANs over a shared physical Ethernet link. When the VSAT is licensed to support virtual LAN (VLAN) trunking, it is capable of keeping the traffic for different VLANs separated over the satellite link, too. The VSAT can then carry the traffic for multiple VLANs and allow you to extend the VLANs across the SatLink network.

By default, the Ethernet interface does *not* operate in the VLAN trunk mode (802.1Q). The interface must explicitly be configured to establish a VLAN interface for each applicable VLAN ID and will then implicitly be set to operate in the VLAN trunk mode (802.1Q). Traffic from VLANs without an established VLAN interface will be silently discarded by the VSAT, as all traffic in VLAN trunk mode has to flow through the VLAN interfaces. Make sure that the Ethernet interfaces connected to the VSAT also operate in VLAN trunk mode (802.1Q) and provide the correct VLAN tag values.

The DHCP server is disabled when the Ethernet interface operates in VLAN trunk mode. The hosts on each VLAN must either get their IP addresses through manual configuration or there must be another device on each VLAN that acts as a DHCP server.

By default, all traffic from established VLAN interfaces is mapped to the common satellite channel. By explicit configuration, each established VLAN can be tied to a GRE tunnel. Then, the specific VLAN traffic that matches the GRE subnet of the associated GRE tunnel will flow into this GRE tunnel; other traffic from the VLAN will be routed to the appropriate interface, which may be the DVB interface or an unblocked VLAN interface. Traffic that comes out of the GRE tunnel gets the associated VLAN tag at submission to the LAN. Only packets with a destination that matches the subnet of the VLAN interface will be forwarded; traffic to other destinations is silently discarded. Thus the subnet at the remote GRE tunnel endpoint should not exceed the subnet of the VLAN interface.

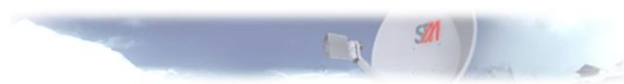
It is assumed that the tunnel destination of each GRE tunnel terminates in a device that is configured to map to the same VLAN as the local end, as required. Note that the SatLink network is an IP network and not an Ethernet MAC bridge and thus the VLAN tag will not be carried through the SatLink network, but must be regenerated locally at the GRE egress point, if required.

Let's say that operator wants to connect VLAN and VLAN over the same SatLink VSAT, connecting to two routers with addresses 10.20.1.1 and 10.20.1.2.

First, establish a local VLAN interface for each of the applicable VLANs:

```
# eth vlan 15
# eth vlan 16
```

By default, inter-VLAN communication is blocked. Alternatively, each of the VLANs can explicitly be allowed local inter VLAN communications through the SatLink VSAT as the local VLAN interface is



established. Traffic is then allowed to flow locally between two VLANs if both are explicitly allowed inter-VLAN communication.

How to establish the VLAN interfaces and also allow local inter VLAN communication between VLAN and VLAN:

```
# eth vlan -allow 15
# eth vlan -allow 16
```

Then, find the automatically assigned interface IDs for the VLAN interfaces:

```
# eth show
```

VLAN Configurations

VLAN Id	IF Index	Inter VLAN Comm
15	11	Allow
16	12	Allow

Now give each of the VLAN interfaces an IP address and an IP subnet. The interface IP address must be reachable through the SatLink network so that the GRE tunnel packets from the other side of each GRE tunnel reach the respective VLAN interface!

```
# ip set 11 10.10.21.1 255.255.255.0
# ip set 12 10.10.22.1 255.255.255.0
```

Finally, associate a GRE tunnel to each of the VLAN interfaces. This causes the IP address of the respective VLAN interface to be set as the tunnel source IP address of the respective GRE tunnel.

```
#ip gre add 192.168.1.0 255.255.255.0 10.20.1.1 11
#ip gre add 192.168.2.0 255.255.255.0 10.20.1.2 12
```

```
#ip gre show
```

GRE Tunnel Interfaces:

```
-----
If      Tunnel Local Address      Tunnel Remote Address
4       10.10.21.1                 10.10.20.1
5       10.10.22.1                 10.10.20.2
```

It is assumed that the other endpoint of each of the GRE tunnels maps back to the respective VLAN interface IP addresses as the tunnel destination. The address spaces of the two GRE tunnels are independent, as they connect to different VLANs and they may be overlapping.

18.6 Ethernet User Priority (802.1p/D)

IEEE Std 802.1Q defines an Ethernet frame format that can be used to carry user priority across a LAN. IEEE Std 802.1p/D describes how user priority can be used to control queuing delay in an Ethernet MAC bridge. In a similar way, the VSAT can control queuing delay before transmission to the satellite, based on the user priority tag values and the chosen mapping to QoS groups. When the VSAT is licensed to support VLAN extension, the VSAT is also capable of mapping user priority tag values to QoS groups. However, the interface must be in VLAN trunk mode to receive user priority, as described in section 18.5.

By default, the user priority does not affect the choice of QoS group and the packets are subject to inspection by the MFC. As required, the VSAT can be configured to map a specific user priority tag value to a specific QoS group. This effectively bypasses the IP header inspection, classification and



mapping offered by the MFC. Untagged frames are always forwarded to the MFC. Make sure that the Ethernet interfaces connected to the VSAT operate in VLAN trunk mode (802.1Q) and provide correct user priority tag values.

Note that the SatLink network is an IP network and not an Ethernet MAC bridge and thus the user priority value will not be regenerated at the egress of the SatLink network.

Let's say that user wants to implement a "scavenger class" for, as an example, peer-to-peer traffic and a best effort class for normal traffic, based on Ethernet user priority:

First, set the Ethernet in VLAN trunk mode and allow traffic on applicable VLAN IDs:

```
# eth vlan 0
```

Here it is assumed that all traffic is going on the single VLAN ID 0 (e.g., being the default VLAN of the LAN). Furthermore, the user priority tag values are mapped to QoS groups:

```
# eth primap 0 6      maps default user priority to internal critical data (becoming external
                        best effort)
# eth primap 1 0      maps user priority 1 down to internal best effort (becoming scavenger)
# eth primap 2 0      maps user priority 2 down to internal best effort (becoming scavenger)
# eth primap 3 6      maps user priority 3 to internal critical data (becoming external best
                        effort)
# eth show
```

Ethernet User Priority to QoS Group mapping

Priority	QoS Group
0	6
1	0
2	0
3	6

18.7 DVB-S2 16-APSK

To enable the SatLink VSAT (SatLink 1000 and 1910 Rev 3.x, SatLink 2000, and SatLink 2900) to receive 16-APSK DVB-S2 signals, the license key must be set to configure this. The below example shows a printout of the `sw show` CLI command for VSAT with the appropriate DVB-S2 16APSK license:

```
# sw show
SW versions:
Boot           : 14.0.0.16
Current        : 14.0.0.14
Backup         :

Manual SW upgrade settings:
TFTP server IP addr : 10.10.1.1
File name           : new.tgz

Automatic SW upgrade settings:
Activated          : No
PID                : 511
IP address         : 224.0.1.59
Port No.           : 2001

Licenses for SW options:
NAT
```



PEP-TCP
DVBS2-16APSK



19. Extensions for Mobile VSATs

The extensions in this appendix are available for the SatLink 1910 and 2900 VSATs with the MOBILE software license key set. To use the transmit inhibit function described in section 19.1, the SatLink 1910 must be equipped with the SatLink 100 plug-in card, revision 2.0 or newer. For the SatLink 2900, the transmit inhibit function is supported via the built in J1 connector and no plug-in card is required for supporting the transmit inhibit function.

The below example shows a printout of the `sw show` CLI command for a VSAT with the appropriate mobile license:

```
#
sw show

SW versions:
Boot           : 9.0.1.7
Current        : 13.0.2.65

Manual SW upgrade settings:
TFTP server IP addr : 10.10.1.1
File name          : new.tgz

Automatic SW upgrade settings:
Activated         : Yes
Upgrade status    : Waiting
PID               : 1022
IP address        : 224.0.1.59
Port No.          : 2001

Licenses for SW options:
GRE
MOBILE
PEP-TCP
QOS-4
PEP-HTTP
VLAN
```

19.1 Transmit Inhibit Function

In order to comply with FCC regulations, an external push button has to be installed on Maritime VSAT installations, making the VSAT transmitter stop transmission within 100 ms after pushing the button.

The SatLink 2900 and SatLink 1910 (with SatLink 100 plug-in card installed) are capable of interfacing an external push button to implement this “transmit inhibit” function, typically being used to avoid exposing people who have to work in the area around the antenna to the transmitted signal. When transmit inhibit mode is cleared by releasing the external switch, the transmitter will be re-enabled.

19.1.1 SatLink 1910

The transmit inhibit switch is connected to the SatLink 100 plug-in card at the two center pins of the RJ11 connector, as shown in Figure 41 below. When short-circuited, transmit inhibit function is activated.

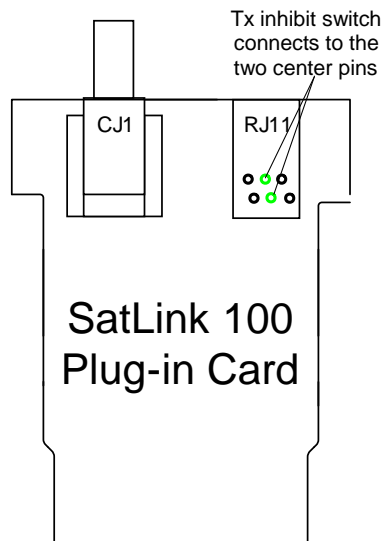


Figure 41: Connection of Transmit Inhibit Switch to SatLink 100

When transmit inhibit mode is set or cleared, an event is logged. The error LED of the SatLink 1910 will be lit when transmit inhibit mode is activated.

When Tx inhibit is activated and deactivated it will be printed like this in the VSAT's CLI:

```
TX Inhibit activated!!!
TX Inhibit deactivated
```

It will also be logged to file, so it is possible to check when it has been used.

```
# log show
LOG SHOW at 15/03/2010 18:21:58
```

```
Events stored in memory since last reboot
```

```
-----
Event Date Time Src Severity
-----
```

```
Terminal Logoff (TX Inhibit activated) 15/03/2010 18:21:33 Normal
```

When Tx inhibit is activated, the VSAT will continue to stay locked to the FWD link and the ODU remains powered on, but the VSAT will not transmit anything. When Tx Inhibit is deactivated, the VSAT will immediately log on to the Hub.

19.1.2 SatLink 2900

The J1 (RJ45) connector on SatLink 2900 has the same “transmit inhibit” functionality as of RJ11 connector on the SatLink 100 for the SatLink 1910. The transmit inhibit switch is connected to the J1 connector at pin 1 of the RJ45 connector for the input signal (Tx) as shown in **Figure 42** below.

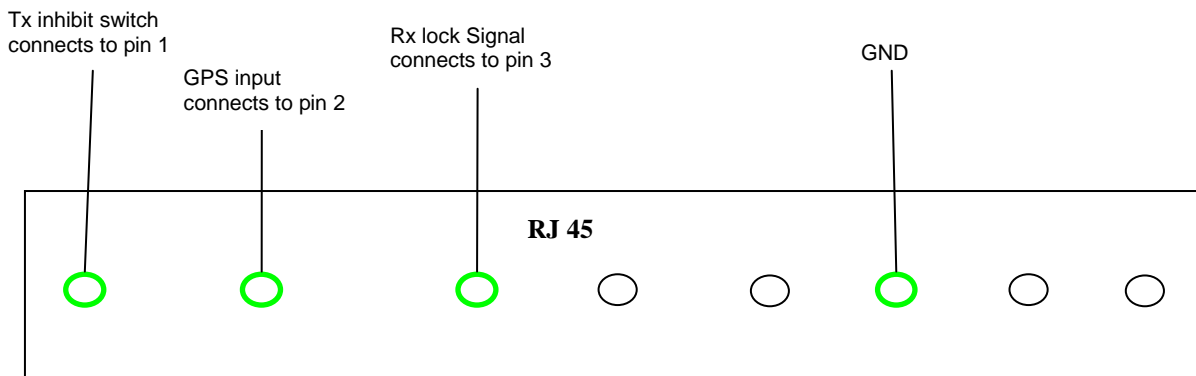


Figure 42: J1 Connector Pin Mapping

19.2 GPS Interface

The SatLink 1910 and SatLink 2900 with a mobile license key set can automatically read their GPS position from an external GPS via the NMEA-0183 protocol and hence constantly have available the correct GPS position for use in calculating correct delay to the satellite to enable the logon burst to be sent with correct timing when the mobile VSAT wants to enter a SatLink network.

The SatLink 2900 can automatically read its GPS position from the GPS input received via the J1 connector (uses pin 2 and common GND on pin 6 in **Figure 42**). On the SatLink 1910 the GPS input is read via the DSUB connector using a special adapter cable.

Two NMEA-0183 GPS strings, GPGLL and GPGGA, are supported by the SatLink mobile VSATs.

The GPGLL GPS string concerns the geographic position. STM supports the following string:

```
$GPGLL,4916.45,N,12311.12,W,225444,A,*31
```

This string indicates a latitude of 49 degrees, 16.45 minutes North and a longitude of 123 degrees, 11.12 minutes West, with a fix taken at 22:54:44 UTC. Data status is set to A, or active (can be set to V, or void). Checksum data is indicated by the 31 at the end of the string.

The GPGGA GPS string concerns the global positioning system fix data. STM supports the following string:

```
$GPGGA,123519,4807.038,N,01131.000,E,1,08,0.9,545.4,M,46.9,M,,*47
```

Parsing out the fields sequentially in the string, we find that this string indicates a fix taken at 12:35:19 UTC, for the latitude 48 degrees, 7.038 seconds North and the longitude 11 degrees, 31 seconds East. The “1” following the “E” indicates a selection from one of 9 possible options for fix quality, 0-8. These options are:

- 0: Invalid
- 1: GPS Fix (SPS)
- 2: DGPS Fix
- 3: PPS Fix
- 4: Real Time Kinematic
- 5: Float RTK
- 6: Estimated (Dead Reckoning)
- 7: Manual Input Mode
- 8: Simulation Mode



After the fix quality option comes “08”, representing the number of satellites being tracked. The horizontal dilution of position is 0.9. The altitude in meters above sea level is 535.4 meters, and the height of geoid (mean sea level) above the WGS854 ellipsoid is 46.9 meters. The two empty fields represent the time in seconds since the last DGPS update and the DGPS station ID number. At the end of the string is the Checksum data, 47.

Serial interface settings specified for use with NMEA-0183 are:

Baud Rate:	4800
Data:	8 bits
Parity:	None
Stop:	1 bit
Flow Control:	None

19.3 RX Lock Signal

The SatLink 2900 outputs a RX lock signal on connector J1 to signal to external units when it is locked to the Forward Link. The output signal is a 3.3V TTL signal, where "low" signals that the RX is locked and "high" signals that the RX is not locked. See **Figure 42** where the lock signal is found on pin 3 and uses the common GND on pin 6.

19.4 Optimizing the Mobile VSAT for Recovering Contact with the Network after Blockings

The `dvb tablecache` command can be used to tune the behaviour of mobile VSATs that experience short blockings, as on trains passing through tunnels. This CLI command allows for configuring the mobile VSATs to wait longer before deciding that the link to the SatLink Hub has been lost and start reacquiring the Forward Link. The format of the command is:

```
dvb rx tablecache <on|off> [<tunerRetryTime>]
```

The `tunerRetryTime` parameter sets the maximum tuner retry time in seconds. After running the `dvb tablecache` command, the `dvb rx stop` and `start` commands are needed to activate a changed time. Below is an example with a tuner retry time of 180 seconds:

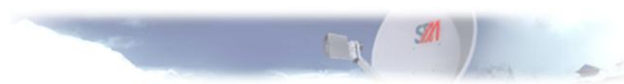
```
dvb rx tablecache on 180
dvb rx stop
dvb rx start
```

The mobile VSAT will wait 3 minutes after detecting an outage before it starts to reacquire the Forward Link and re-read all DVB tables. If the Forward Link is found again within 3 minutes, the mobile VSAT will simply resume communication with the Hub immediately and assume the outage was just caused by a short blocking.

The example below disables the optimized tuning for mobile VSATs.

```
dvb rx tablecache off
```

It should be noted that the `tablecache` command is only recommended for use with mobile VSATs as the standard configuration is optimized for fixed VSATs. Note also that one generally wants to increase the `TunerRetryTime` to recover two-way communication faster after a blocking, but setting this parameter too high will cause longer outages in case of a real outage where Forward Link re-acquisition might be required to recover.



19.5 Mobile VSAT LAN Interface to Mobile Antenna Controller

19.5.1 Introduction

This interface allows bidirectional IP communication between a mobile VSAT and a Mobile Antenna Controller, and it is used to:

- Configure the Mobile Antenna Controller with satellite position and polarization
- Configure the Mobile Antenna Controller with the frequency to be used to track the satellite
- Periodically provide Forward Link lock status to the Mobile Antenna Controller
- Periodically collect the status of the Mobile Antenna Controller
- Periodically collect the GPS position from the Mobile Antenna Controller (the GPS position is used in calculating correct delay to the satellite to enable the logon burst to be sent with correct timing when the mobile VSAT wants to enter a SatLink network.)



Note: The SatLink VSAT needs to have mobile license key.

19.5.2 Configure Antenna, BUC and LNB Types

Currently the mobile VSAT software supports communication to SeaTel Antenna Controllers models DAC 2202 or DAC 2302. The controller is selected indirectly by selecting the antenna type.

Use the following CLI command to display the current configuration of antenna, BUC and LNB types:

```
# odu show
```

Use the following CLI commands to reconfigure them as per the actual hardware to be used:

```
# odu antenna <type>
```

```
# odu txtype <type>
```

```
# odu lnb <type>
```

The antenna type should be one of the following mobile antennas:

Antenna Type	Description
18	Seatel 2406 - 0.6m
8	Seatel 4003 - 1.0m
19	Seatel 4006 - 1.0m
20	Seatel 6006 - 1.5m

Example:

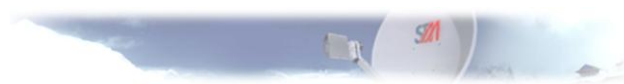
```
# odu antenna 8
# odu txtype 71
# odu lnb 72
# odu show
```

Antenna

```
Type                               Seatel 4003 - 1.0m
Antenna controller                 DAC 2202 / 2302
Tx Gain at 14.25 GHz               40.0dB
```

Transmitter (BUC)

```
Type                               CODAN 6908 w/ext. power supply (14.0-14.5 GHz)
Local oscillator                   15.450000 GHz
DC supply                           Off
```



Receiver (LNB)

```
-----
Type                               SMW Q-PLL Type R (10.70-12.75 GHz)
Local oscillator - LO1             10.000000 GHz
Local oscillator - LO2             10.750000 GHz
Local oscillator - LO3             11.300000 GHz
Local oscillator - LO4             9.750000 GHz
Oscillator switching frequency 1-2 11.260000 GHz
Oscillator switching frequency 2-3 11.700000 GHz
Oscillator switching frequency 3-4 12.250000 GHz
13/18V DC supply                   Off
```



Note: Use 'save config' to preserve the changes to the parameters configuration.



Note: VSAT restart is required before the new configuration is activated correctly when antenna, BUC, or LNB types are changed.

19.5.3 Enable and Configure the Antenna Controller Interface

Enable the control of Mobile Antenna Controller (DAC) and/or GPS input, using the following CLI command:

```
# odu antctrl enable <all | ctrldac | gps | off>
```

Parameter	Description
all	Enables both control of DAC and GPS input
ctrldac	Enables only control of DAC and disables the GPS input
gps	Enables only GPS input and disables the control of DAC
off	Disables antenna controller communication from IDU (both control of DAC and GPS input will be disabled)

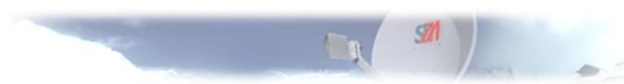
- Option 'all' enables IP communication between the mobile VSAT and a known Mobile Antenna Controller (such as SeaTel DAC 2202 / 2302). Through this interface mobile VSAT can configure the antenna controller, exchange status information and collect GPS position.
- Option 'off' disables IP communication between the mobile VSAT and the Mobile Antenna Controller.
- Option 'gps' enables IP communication between the mobile VSAT and the Mobile Antenna Controller but only to collect GPS position.
- Option 'ctrldac' enables IP communication between the mobile VSAT and the Mobile Antenna Controller to send configuration and exchange status but will not collect GPS position.



Note: When the interface to Mobile Antenna Controller is enabled with options 'all' or 'gps', the GPS serial interface (in SatLink 1910 or SatLink 2900) should be disconnected.

Configure the IP address of the Mobile Antenna Controller (which must be accessible through the IDU LAN interface), using the following CLI command:

```
# odu antctrl ip <ipaddr>
```



Parameter	Description
Ipaddr	IP address of the Mobile Antenna Controller (DAC)

Configure the periodic time used to communicate with the Mobile Antenna Controller, using the following CLI command:

```
# odu antctrl periodictime <time-in-sec>
```

Parameter	Description
time-in-sec	Value in seconds to set the periodic time (polling frequency) to communicate with the Mobile Antenna Controller <ul style="list-style-type: none"> Status exchange will happen every 'time-in-sec' Collection of GPS position will happen every '3 x time-in-sec' A value of 0 will disable the communication with the Mobile Antenna Controller

To show the current configuration and status of the Mobile Antenna Controller use the following CLI command:

```
# odu antctrl show [<all>]
```

Parameter	Description
All	Option 'all' will display additional information collected from the Mobile Antenna Controller

Example:

Show the current configuration and status of the interface to the Mobile Antenna Controller:

```
# odu antctrl show
Antenna Controller Configuration
-----
Type                : DAC 2202/2302
Enabled             : Off
IP address          : 0.0.0.0
Polling frequency   : 0 sec
```

Antenna Controller Status

```
-----
Controller detected  : no
Packets sent        : 0
Packets received     : 0
```

Configure the interface to the Mobile Antenna Controller:

```
# odu antctrl enable all
# odu antctrl ip 10.5.4.195
# odu antctrl periodictime 5
```

Show the new configuration and status of the Mobile Antenna Controller:

```
# odu antctrl show
Antenna Controller Configuration
-----
Type                : DAC 2202 / 2302
Enabled             : All
IP address          : 10.5.4.195
Polling frequency   : 5 sec
```

Antenna Controller Status

```
-----
Controller detected  : yes
SeaTel Comm Interface : Comm IF Ver 1.12 Port TCP-0
Signal Strength (AGC) : 112
```



```
Critical Alarm      : PCU Communication Error
Packets sent       : 2
Packets received   : 2 [assembled : 3]
```

Antenna Controller Command/Response Summary

```
-----
TrackDisp          : 130
```

The above status shows that the Antenna Controller is detected. This means the mobile VSAT and the Antenna Controller have established IP connection and are exchanging messages.



Note: Use 'save config' to preserve the changes to the parameter configuration.



Note: VSAT restart is required before the new configuration is activated correctly when the IP address of the Antenna Controller is changed.



Note: Changing the "periodic-time" parameter does not require a restart, however it will require the previous time period to elapse before the new one goes into effect.

19.5.4 Configure the Forward Link Entries (Beams)

Once the control of the Mobile Antenna Controller is enabled, the CLI command 'dvb rx show' will display, for each Forward Link entry (beam), the following four additional parameters:

- SatPos: Satellite orbital position in degrees
- RxPol: VSAT RX polarization (Horizontal or Vertical)
- TxPol: VSAT TX polarization relative to the RX polarization (Cross-Pol or Co-Pol)
- SatRot: Satellite polarization rotation angle (polarization skew) in degrees

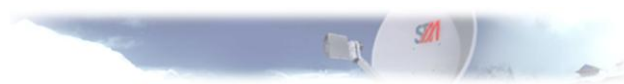
All four additional Forward Link parameters must be configured; they are not used by the VSAT IDU to search for the Forward Link, but they are required by the Mobile Antenna Controller to align the antenna and track the satellite.



Note: Confirm with the Hub operator that the Forward Link beams are configured with the correct values for satellite position and satellite downlink (TX) polarization. Once the mobile VSAT locks to a Forward Link beam, the "SatPos" and "RxPol" configured for that Forward Link entry in the mobile VSAT will be overwritten with the satellite position and downlink polarization values received in the SI tables.

Use the CLI command 'dvb rx fwdlink' to configure these parameters:

```
# dvb rx fwdlink <idx> <pri> [<sybrate> [<freq> [<mode> [<popid> [<satpos>
[<rxpol> [<txpol> [<satpolrot>]]]]]]]
```



Parameter	Description
satpos	Satellite orbital position in 1/10 degrees Range: -1800 to 1800 (-180.0 to 180.0) Negative sign = West Without sign = East
rxpol	VSAT RX polarization 0 = Horizontal 1 = Vertical
txpol	VSAT TX polarization relative to the RX polarization 0 = Cross polarization (default) 1 = Co polarization
satpolrot	Satellite polarization rotation angle (polarization skew) in 1/10 degrees Range: -150 to 150 (-15.0 to 15.0)

Example:

```
# dvb rx fwdlink 1 1 8390203 11540600 dvbs2 44 -220 0 0 0
# dvb rx fwdlink 2 2 28000000 12418000 dvbs 6 -10 1 0 0
# dvb rx fwdlink 6 0 5000000 11090575 dvbs2 3 -10 1 0 0
# dvb rx show
```

Satellite (DVB) RX Configuration

```
-----
Auto start           : Enabled
RX watchdog          : Disabled
Cached DVB Tables    : Disabled
Tuner retry time     : 0
```

Idx	Pri	SymbRate[Msps]	Freq[GHz]	Mode	PopId	SatPos	RxPol	TxPol	SatRot
1	1	8.390203	11.540600	DVB-S2	44	22.0 W	Hor	Xp	0.0 E
2	2	28.000000	12.418000	DVB-S	6	1.0 W	Vert	Xp	0.0 E
6	0	5.000000	11.090575	DVB-S2	3	1.0 W	Vert	Xp	0.0 E

Receiver Status (SatLink 100)

```
-----
Rx State             : Off
DVB State             : Off
```



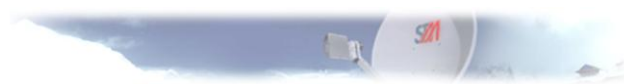
Note: Use 'save config' to preserve the changes to the parameter configuration.

19.5.5 Configure the Forward Link Re-Acquisition Parameters

The Forward Link re-acquisition parameters tune the behavior of the SatLink VSAT during the re-acquisition phase when several Forward Link entries are configured.

These parameters are configured using the following CLI command:

```
# dvb rx reacq <time_sec> <attempts>
```



Parameter	Description
time_sec	The time in seconds to try to re-acquire the Forward Link before reconfiguring the receiver and antenna controller (mobile antennas only). Range: 0 to 120 sec Set to 0 to disable
attempts	Maximum number of attempts to try a full receiver reconfiguration and search for the Forward Link after the Forward Link has been lost. For mobile antennas, the receiver configuration also implies the reconfiguration of the antenna controller and re-pointing of the antenna. Range: 1 - 15 attempts Value 1 attempt is the default.

- When the SatLink VSAT loses the Forward Link it will first try to reacquire the same Forward Link for 'time_sec'.
- If re-acquiring the Forward Link fails, the SatLink VSAT will do a full reconfiguration of its receiver with the same Forward Link parameters, including sending again the configuration to the Mobile Antenna Controller, and try again the Forward Link reacquisition. This will be done 'attempts' number of times.
- If the SatLink VSAT still has not been able to re-acquire the Forward Link then it will try to search/acquire another Forward Link, the selection of the next Forward Link will be based on the priority parameter configured for the Forward Link entries.



Note: It is recommended to set 'time_sec' to 0 and 'attempts' to 1 for fixed VSATs. While non-zero 'time_sec' and > 1 'attempts' should be normally configured for mobile VSATs roaming between different Forward Links (beams) and where the mobile VSAT controls the pointing of the mobile antenna.



Note: The recommended starting point for mobile VSATs is to configure 'time_sec' to 30 seconds and 'attempts' to 5, and then tune these parameters to get optimal performance for your installation. The tradeoff is that increasing these values reduces the probability of searching for another Forward Link after a temporary outage but increases the amount of time it takes for an actual beam handover.

Examples:

Configure the VSAT IDU to try to reacquire Forward Link for 30 seconds before reconfigure the receiver, and try full receiver reconfiguration and Forward Link reacquisition 5 times before starting to search for the next beam (Forward Link).

```
# dvb rx reacq 30 5
```

Disable extra time in the normal re-acquisition process and use the default 1 attempt to try to reacquire the Forward Link before searching for next beam (Forward Link).

```
# dvb rx reacq 0 1
```



Note: Use 'save config' to preserve the changes to the parameter configuration.



Note: Changing the "dvb rx reacq" parameters does not require a restart, although the new settings will take effect upon next Forward Link reacquisition.



20. Mesh VSATs

Mesh topology configurations enable direct VSAT-to-VSAT connectivity using a single satellite hop. The main advantage of mesh operation (compared to star) is the low latency for real-time traffic and reduced satellite bandwidth usage.

STM's mesh-capable VSATs are the SatLink 2900 and SatLink1910. The CLI command `device show` in the example below shows the correct hardware required for the mesh operation (for the SatLink 1910):

```
# device show
System Information:
Name           : MESH TERM-8 009F82
Location       :
Contact        :
System Up time  : 0 days, 01:08:47
Core temperature : 36.0 degrees C.
CPU Load       : 18%
System time(UTC) : 2 March 2009 15:06:21
Broadcast Message : not set

HW:
Model          : SatLink 1910
HW ID          : 103798
Main board ID   : 120014 R1.1

Plugin-card HW:
Model          : SatLink 150
HW ID          : 108305
Revision       : 2.0
Serial Number   : 0408030009

MAC addresses:
Ethernet (LAN)  : 00:20:0e:00:9f:82
Satellite (DVB) : 00:20:0e:00:9f:82
```

By default, a mesh VSAT only supports 1 mesh connection, where a mesh connection is one QoS class link to another mesh VSAT. Support for more simultaneous connections is achieved by purchasing a SW license mesh-connection n , where $n = 2, 4, 6, 8, 10, 14$, or 16 .

The example below shows the CLI command `sw show` printout for a VSAT supporting a maximum of 8 simultaneous mesh connections. These 8 simultaneous connections can be realized as 4 QoS class links to 2 remote mesh VSATs, only 1 QoS class link to 8 remote mesh VSATs, or any combination in between.

```
# sw show

SW versions:
Boot           : 9.0.1.7
Current        : 13.0.2.65

Manual SW upgrade settings:
TFTP server IP addr : 10.10.1.1
File name          : new.tgz

Automatic SW upgrade settings:
Activated         : No
PID               : 511
IP address        : 234.5.6.7
```



Port No. : 45678

Licenses for SW options:

PEP-TCP

QOS-4

Max Mesh Connections: 8

A SatLink mesh VSAT is autonomous regarding the mesh operation, and there is no need for setting up any configuration parameters. The mesh operation can be disabled by configuration if desired.

The available mesh CLI commands are listed in the table below.

CLI commands	Available in Boot SW	Available in Application SW	User Privilege Level
dvb mesh enable		x	
dvb mesh disable		x	
		x	
dvb mesh show [-config -links -routes -stat]		X	
dvb brx show [-stats]			
dvb brx stats [enable disable]			
dvb brx offset <freq>			
dvb brx cscLog <value>			

Table 18: Mesh CLI Commands

- *dvb mesh enable, dvb mesh disable*
- These CLI commands enable and disable mesh capability of the VSAT. By disabling the mesh capability, the VSAT is moved to star operation. Note: for a change of this parameter to have effect, the VSAT must be logged off and logged on again.
- *dvb brx show*

This command displays the physical layer status.

```
# dvb brx show
```

Satellite (DVB) Burst Receiver Status

```
-----
State : Fine Sync
RF to B-band offset : -5622 [Hz]
AGC Status : enabled
AGC Gain (relative) : 41 [dB]
Rx Lband Input Level : -50 [dBm]
Satellite LO : 3300000000 [Hz]
Satellite LO Offset : 0 [Hz]
#
```

The parameters displayed by this command are explained in the table below.

Field	Explanation
State	<p>The state of the physical layer. Possible values are:</p> <ul style="list-style-type: none"> - Initialization (burst receiver in initialization state) - Wait for CSC (the VSAT is trying to acquire its own transmitted logon burst) - Coarse Sync (the burst receiver is synchronized with



Field	Explanation
	more than +/- 52 ticks timing error) - Fine Sync (the burst receiver is synchronized with less than +/- 52 ticks timing error)
RF to B-band offset	Total frequency error introduced by the LNB, and receiver analogue front-end in Hz.
AGC Status	Status of the AGC. Either enabled or disabled. In normal operating mode, the AGC state shall always be Enabled.
AGC Gain	Gain applied to the RX chain by the AGC function.
RX Lband Input Level	Unit RX composite input level.
Satellite LO	Satellite Local Oscillator.
Satellite LO Offset	Offset of the Satellite Local Oscillator.

Table 19: dvb brx show Command Parameters

- ***dvb mesh show -config***

This command displays the main mesh configuration as received in mesh logon response in addition to two local status parameters (mesh capability and DLCP client state). Dynamic Link Control Protocol is the protocol used by the VSAT and the hub for mesh operation. The client part of DLCP is implemented in the VSAT. The server part implemented in the hub (DLCP server) is also called a mesh controller.

An example of mesh configuration after successful mesh logon:

```
#dvb mesh show -config
```

```
Satellite Mesh Configuration
```

```
-----
Mesh capability           : Enabled
DLCP client state        : Connected
Mesh Controller IP Address : 10.10.11.30
Mesh Controller DLCP UDP Port : 49359
Satellite Subnet ID      : 1
Satellite Subnet Name    : Mesh Subnet 1
Mesh Controller DLCP MCAST Group : 234.5.6.7
Default GW Address       : 10.10.46.25
DLCP Version             : 1
Max connections          : 16
```

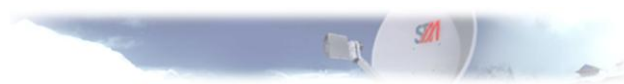
```
Mesh Address Space
```

```
-----
IP Address      Subnet Mask
10.10.46.0 /    255.255.255.0
10.10.47.0 /    255.255.255.0
10.10.48.0 /    255.255.255.0
10.10.49.0 /    255.255.255.0
10.10.50.0 /    255.255.255.0
```

```
Hub Address Space
```

```
-----
IP Address      Subnet Mask
10.10.11.0 /    255.255.255.0
```

The explanation of the displayed parameters is given in the following table:



Field	Explanation
Mesh capability	Enabled by default. Possible values: enabled, disabled
DLCP client state	State of the client controlling mesh operation. One of the following values: Initialization, Logon Requested, Logon in progress, Connected, Logon denied.
Mesh Controller IP address	The IP address of the mesh controller, also called DLCP server.
Mesh Controller DLCP UDP port	The UDP port used for reception and sending DLCP messages.
Satellite Subnet ID	ID of the Mesh Satellite Subnet the VSAT is a part of.
Satellite Subnet Name	The name of the Mesh Satellite Subnet the VSAT is a part of.
Mesh Controller DLCP MCAST Group	Multicast address is the system wide multicast address that applies to all mesh VSATs, regardless of the mesh satellite subnet they belong to.
Default GW Address	The address of the default GW to be used by the VSAT.
DLCP version	The version of the DLCP protocol used by the mesh controller (DLCP server).
Max connections	Max number of mesh connections the VSAT is licensed for.
Mesh Address Space	Address range (destinations) to be reached via dynamic mesh links.
Hub Address Space	Address range (destinations) to be reached using star link (via hub).

Table 20: dvb mesh show -config Command Parameters

- ***dvb mesh show -stat***

This command shows accumulated mesh statistics. The statistics are reset if the VSAT is put back to star operation (by disabling mesh operation).

An example of the values displayed by this CLI command:

```
# dvb mesh show -stat

Dvb Mesh Statistics
-----
Logon Error           : 0
Max connections       : 8
Current connection(s) : 2
Pending message(s)    : 0

                        Local      Remote
LSE Ok                :          0          0
LSE Error              :          0          0
LSR Ok                 :          0          0
LSR Error              :          0          0
```

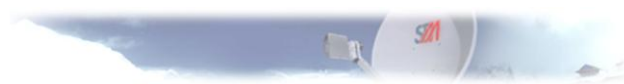
“Local” here denotes link service actions initiated by the VSAT itself. “Remote” denotes the link service actions initiated by the counterpart. LSE stands for Link Service Establishment. LSR stands for Link Service Release.

The explanation of the displayed values is given in the table below.



Field	Explanation
Logon Error	The number of unsuccessful logon attempts.
Max connections	The maximum number of mesh connections. Determined by the SW license.
Current connection(s)	The current number of active meshes connections.
Pending message(s)	The number of DLCP messages sent to the DLCP server (mesh controller), which the response to has not been received.
LSE Ok	Number of successful link service establishments.
LSE Error	Number of rejected link service establishments.
LSR Ok	Number of successful link service releases.
LSR Error	Number of link service releases that failed.

Table 21: dvb mesh show -stat Configuration Parameters



21. Definitions, Acronyms and Abbreviations

8PSK	8-ary Phase Shift Keying
AVBDC	Absolute Volume Based Dynamic Capacity
BCH	Bose-Chaudhuri-Hocquenghem multiple error correction binary block code
BE	Best Effort
BER	Bit Error Rate
BoD	Bandwidth on Demand
BUC	Block Up-Converter
CD	Critical Data
CLI	Command Line Interface
CRA	Continuous Rate Assignment
CSC	Common Signaling Channel
CW	Continuous Wave
Db	Decibel
DiSeqC	Digital Satellite Equipment Control
DNS	Domain Name Service
DVB	Digital Video Broadcasting
DHCP	Dynamic Host Configuration Protocol
DSCP	DiffServ Code Point
DSM-CC	Digital Storage Media-Command and Control
EIRP	Equivalent Isotropic Radiated Power
ETH	Ethernet
FCA	Free Capacity Assignment
FREQ	Forward Link Frequency
FTP	File Transfer Protocol
GPS	Global Positioning System
GRE	Generic Routing Encapsulation
HTTP	Hypertext Transfer Protocol
HTTPA	Hypertext Transfer Protocol Accelerator
HW	HardWare
ID	IDentifier
IDU	InDoor Unit
IETF	Internet Engineering Task Force
IF	Intermediate Frequency
IP	Internet Protocol
IPC	Intercepting Proxy Cache
ICMP	Internet Control Message Protocol
LAN	Local Area Network
LDPC	Low Density Parity Check (codes)
LED	Light Emitting Diode
LNB	Low Noise Block
MAC	Medium Access Control
MFC	Multi Field Classifier
Mcast	Multicast
MIB	Management Information Base
NAT	Network Address Translation
NAPT	Network Address Port Translation
NCC	Network Control Center
ODU	OutDoor Unit
OMT	Ortho-Mode Transducer
OS	Operating System
PAT	Program Association Table

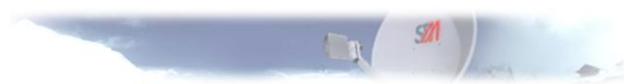


PEP	Performance Enhancement Proxy
PHB	Per Hop Behavior
PID	Packet Identifier
PoPid	Population id
QoS	Quality of Service
RAC	Return Link Access Control
RBDC	Rate Based Dynamic Capacity
RCS	Return Channel on Satellite
RCST	RCS Terminal
RF	Radio Frequency
RFC	Request For Comments
RMT	RCS Map Table
RRM	Radio Resource Management
RT	Real Time
RT-ViC	Real Time Video Conferencing
RT-VoIP	Real Time Voice over IP
RX	Receiver
QPSK	Quaternary Phase Shift Keying
SNMP	Simple Network Management Protocol
SNR	Signal-to-Noise Ratio
SW	SoftWare
TCP	Transport Control Protocol
TDT	Time and Date Table
TFTP	Trivial File Transfer Protocol
TOS	Type Of Service
TS	Transport Stream
TX	Transmit
UDP	User Datagram Protocol
VBDC	Volume-Based Dynamic Capacity
VLAN	Virtual LAN
VoIP	Voice Over Internet Protocol
VSAT	Very Small Aperture Terminal



22. References

- [1] *STM SatLink 4033/4035. 2W/3W Ku-band Transceivers. Installation Instruction, STM* document No. 105894.
- [2] SatLabs Group website at www.satlabs.org
- [3] Digital Video Broadcasting website at www.dvb.org
- [4] European Telecommunications Standards Institute website at www.etsi.org
- [5] *Digital Video Broadcasting (DVB); Interaction channel for satellite distribution systems*, ETSI EN 301 790, V1.4.1



Appendix A. Accessing the Command Line Interface via Serial Console Port

In some special situations, the Command Line Interface via Telnet may not be accessible or will not output the required amount of debug information. Typical examples of such situations are:

- The VSAT is configured with an unknown IP address
- One needs to enter the boot-loader
- Detailed debugging

The Command Line Interface may then be accessed from a local PC connected to the VSAT's RS-232 interface via a serial cable. HyperTerminal, or any compatible terminal emulation program, is used to access the CLI interface via RS-232. A good freeware terminal emulator is Tera Term Pro Web 3.1.3. The software can be downloaded from Ayera home page: <http://www.ayera.com/teraterm>.

A.1 Cable Connection

To get access to the command-line interface (CLI) via the serial connection, a serial cable is connected from the SatLink VSAT directly to a COM port on a PC:

- Plug the 9-pin connector (DB09) (male) into the rear panel of the SatLink VSAT.
- Plug the 9-pin connector (DB09) (female) into a COM port on the PC.

A.2 PC Configuration of HyperTerminal to Access the CLI via Serial Port.

In Windows, click the *Start* button and select *All Programs* → *Accessories* → *Communications* → *HyperTerminal*. HyperTerminal will then start and the Connection Description dialogue box, shown in Figure 43, will appear. The screen shots are from Windows XP Professional; other versions of Windows may display differently.



Figure 43: Hyper Terminal New Connection Dialogue Box

Enter a name, select an icon for the connection, and click OK. The Connect To dialogue box, shown in Figure 44, will appear.



Figure 44: Hyper Terminal Connect To Dialogue Box

Select the COM port where the serial cable attached to the VSAT is connected and click OK. The COM port Properties box will appear, as shown in Figure 45.

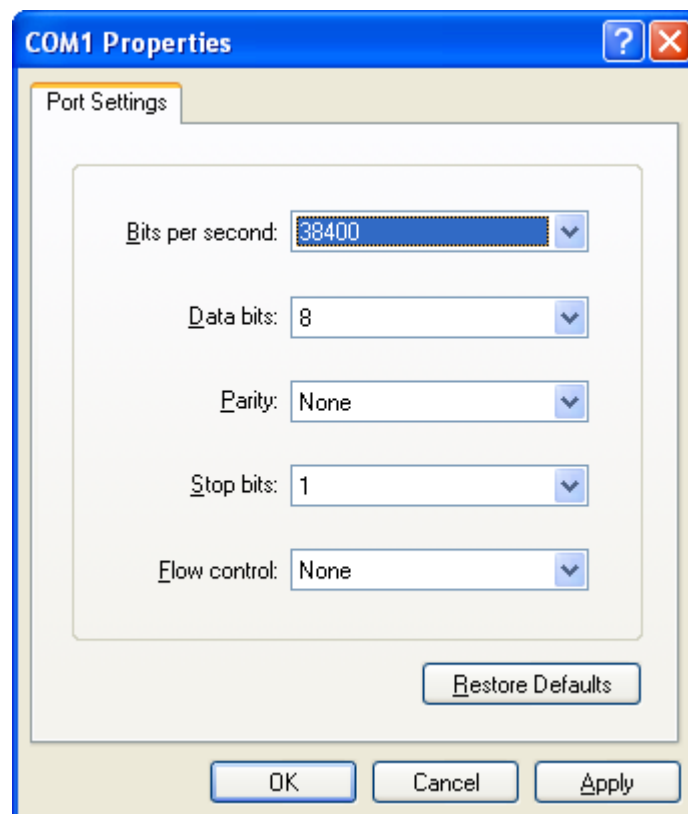


Figure 45: Hyper Terminal COM1 Properties Box



Use the pull-down lists to enter:

- Bits per second: 38400
- Data bits: 8
- Parity: None
- Stop bits: 1
- Flow control: none

Click Apply to accept the properties. The property sheet will close and communication with the SatLink VSAT may begin.

Note that it may be necessary to press the enter key to display the login prompt.

When closing the session and exiting HyperTerminal, allow the program to save the session, which will place an icon and session name into the HyperTerminal directory on the Start menu, allowing for future quick connections.



Appendix B. TFTP Server

TFTPD32 is a freeware TFTP server for Windows 9x/NT/XP PCs (but seems to work on Windows 2000 as well), which is small and easy to install and use. Use the link below to download the software.

<http://tftpd32.jounin.net/>

Short installation description:

1. Install the program on a PC located at either the Hub or a local LAN.
2. Start the program.
3. Select the correct server interface if using a PC with more than one Ethernet card.
4. Select the correct base directory (the directory where the files to be downloaded are stored and where uploaded files will be stored).
5. You are now up and running with a TFTP server.
6. The TFTP server can now be accessed from the VSAT by using the CLI commands `upload` and `dload`.

TFTP upload from and download to the VSAT have been tested with version 3.23 of this TFTP server, but any TFTP server should work. It is, however, essential that the TFTP server has support for negotiation of block lengths up to 8 Kbytes in order to obtain satisfactory performance over the satellite link, in terms of acceptable download time.

The VSAT can access a TFTP server on both the satellite and the Ethernet interface.



Appendix C. Telnet Client

A good freeware Telnet client is Tera Term Pro Web 3.1.3. The software can be downloaded from Ayera home page: <http://www.ayera.com/teraterm>. Especially when running Telnet from Windows XP, it is recommended to use Tera Term instead of the built in Telnet Client, since setting Local Echo in the Windows XP client does not seem to work.

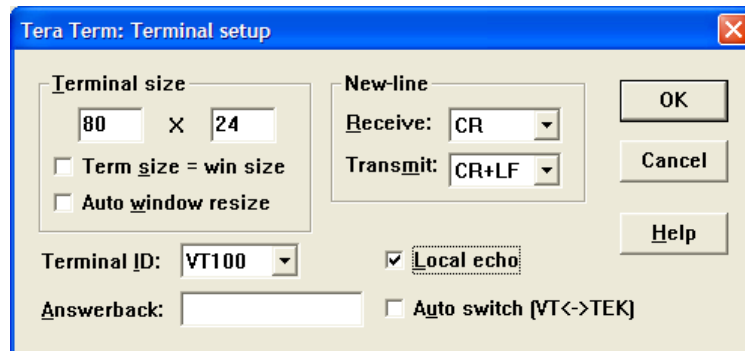
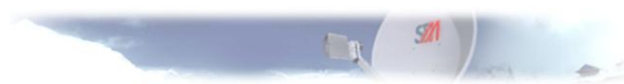


Figure 46: Tera Term Terminal Setup

When starting Tera Term, choose the Setup menu then Terminal. Enable Local echo as shown in Figure 46. Next, choose the Setup menu and then Save Setup to save this configuration.

Tera Term may also be used as a replacement for HyperTerminal.



Appendix D. Testing the Connection to the VSAT

D.1 Ping Function

The VSAT CLI ping command is useful for determining the status of the network and various foreign hosts, tracking and isolating hardware and software problems, and testing, measuring, and managing networks. The Ping command bounces a small packet off a domain or IP address to test network communications, and then tells how long the packet took to make the round trip.

Usage:

1. ping <ipaddr> [<options>]
2. ping -stop
3. ping <-enablemonitor|-disablemonitor>

Description for usage 1:

Ipaddr	IP address to ping
<options>	continuous ping until stopped, ping -stop to stop
-t	-t has higher precedence than -count
-size -s <size>	size in bytes (32 to 1400 bytes) default size 64 bytes
-n -c -count <count>	Number of echo requests to send. default five echo requests
-w <timeout>	Timeout in seconds (1 to 10 seconds) to wait for each reply (default 3 secs).
-dw	Ping is by default enabled to send requests immediately after responses to earlier requests are received, provide this option to wait for default three seconds between requests or to override the timeout with the -w option.

Examples:

```
ping 10.10.11.2
ping 10.10.11.2 -t -size 128
ping 10.10.11.2 -c 10 -s 100
ping 10.10.11.2 -t
ping 10.10.11.2 -w 5
ping 10.10.11.2 -dw
```

```
ping 192.168.11.26
64 bytes from 192.168.11.26: time=42 ms
64 bytes from 192.168.11.26: time=42 ms
64 bytes from 192.168.11.26: time=94 ms
64 bytes from 192.168.11.26: time=60 ms
64 bytes from 192.168.11.26: time=38 ms
```

```
--- 192.168.11.26 ping statistics ---
5 packets transmitted, 5 received, 0 percent packet loss
rtt min/avg/max = 38/58/94 ms
```

Description for usage 2:

-stop	stops a continuous ping started using ping <ipaddr> -t
-------	--

Example:



To stop a continuous ping (started with option -t) execute the command
ping -stop

Description for usage 3:

-enablemonitor	enables displaying a message on the console whenever an ICMP Echo request is received
-disablemonitor	disables displaying a message on the console whenever an ICMP Echo request is received

Example:

To turn on displaying of ICMP Echo requests execute the command
ping -enablemonitor (-enamon or -em works also)

Then if the VSAT receives five ICMP Echo (ping) request from the host 10.10.11.9, the console will display:

```
ICMP: echo request rcvd, src 10.10.11.9, dst 10.10.11.2
ICMP: echo request rcvd, src 10.10.11.9, dst 10.10.11.2
ICMP: echo request rcvd, src 10.10.11.9, dst 10.10.11.2
ICMP: echo request rcvd, src 10.10.11.9, dst 10.10.11.2
ICMP: echo request rcvd, src 10.10.11.9, dst 10.10.11.2
```

To turn off displaying of ICMP Echo requests execute the command
ping -disablemonitor (-dismon or -dm works also)

D.2 FTP Server (Upload/Download)

The internal FTP server allows a user to conduct FTP server testing for satellite link to hub for upload/download of predefined test pattern file. The FTP server test can be conducted for both LAN and DVB interfaces. The internal FTP server test is intended to test the upload and download of files using the FTP feature between the hub / local PC with the terminal.

FTP to LAN Interface

The following example shows how to use the FTP to LAN interface for downloading.
The same procedure can be followed for uploading FTP to LAN interface.

1. Log the VSAT onto the HUB.
2. From a workstation on the HUB side, log on to the VSAT using the DOS prompt and the FTP command. The operator can use either the root or install user.
3. Type FTP <LAN IP address of the terminal>.
4. Enter the correct user name and password.



```

C:\ Command Prompt - ftp 10.20.41.1
(C) Copyright 1985-2003 Microsoft Corp.

C:\Documents and Settings\Administrator.DUB-RCS.000>ping 10.20.41.1

Pinging 10.20.41.1 with 32 bytes of data:

Reply from 10.20.41.1: bytes=32 time=40ms TTL=62
Reply from 10.20.41.1: bytes=32 time=43ms TTL=62
Reply from 10.20.41.1: bytes=32 time=35ms TTL=62
Reply from 10.20.41.1: bytes=32 time=37ms TTL=62

Ping statistics for 10.20.41.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 35ms, Maximum = 43ms, Average = 38ms

C:\Documents and Settings\Administrator.DUB-RCS.000>ftp 10.20.41.1
Connected to 10.20.41.1.
220 Service ready for new user.
User (10.20.41.1:(none)): root
331 User name okay, need password.
Password:
530 Not logged in.
Login failed.
ftp>
  
```

5. Type `bin` in the command prompt.
6. Type `hash` in the command prompt.
7. Type `get xxx_5mb.tst` [xxx could be any letter] to download from the VSATs LAN interface.
8. The same steps can be followed for downloading from the DVB interface.

The screenshot displays two overlapping Windows Command Prompt windows. The top window shows an active FTP session with the following commands and outputs:

```
C:\Documents and Settings\Administrator\FTP-000>ftp 10.20.41.1
Connected to 10.20.41.1.
220 Service ready for new user.
User (10.20.41.1:(none)): root
331 User name okay, need password.
Password:
230 User logged in, proceed.
ftp> bin
200 Command okay.
ftp> hash
Hash mark printing On  ftp: (2048 bytes/hash mark) .
ftp> get xxx_5mb.tst
200 Command okay.
150 File status okay; about to open data connection.
```

The bottom window shows the continuation of the FTP session, displaying a large volume of hash marks representing the file transfer progress, followed by completion messages:

```
250 Requested file action okay, completed.
226 Closing data connection.
ftp> 5242880 bytes received in 16.00Seconds 327.68Kbytes/sec.
ftp>
```

FTP to DVB Interface

The following example shows how to use the internal FTP to DVB interface for uploading. The same procedure can be followed for downloading the FTP to DVB interface.

1. Log the VSAT onto the HUB.
2. From a workstation on the HUB side, log on to the VSAT using DOS prompt and the FTP command. You can use either root or install user.
3. Type FTP <DVB IP address of the terminal>.
4. Enter the correct user name and password.

```

C:\Command Prompt - ftp 10.42.0.41
Microsoft Windows [Version 5.2.3790]
(C) Copyright 1985-2003 Microsoft Corp.

C:\Documents and Settings\Administrator.DVB-RCS.000>ping 10.42.0.41

Pinging 10.42.0.41 with 32 bytes of data:

Reply from 10.42.0.41: bytes=32 time=37ms TTL=62
Reply from 10.42.0.41: bytes=32 time=94ms TTL=62
Reply from 10.42.0.41: bytes=32 time=70ms TTL=62
Reply from 10.42.0.41: bytes=32 time=40ms TTL=62

Ping statistics for 10.42.0.41:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 37ms, Maximum = 94ms, Average = 60ms

C:\Documents and Settings\Administrator.DVB-RCS.000>ftp 10.42.0.41
Connected to 10.42.0.41.
220 Service ready for new user.
User (10.42.0.41:(none)): install
331 User name okay, need password.
Password:
230 User logged in, proceed.
ftp>

```

1. Type `bin` in the command prompt.
2. Type `hash` in the command prompt.
3. Type `put xxx.tst` [xxx could be any letters] to upload from the VSATs DVB interface.
Note, make sure this `xxx.tst` file already exists on the hub or workstation first before the test.
4. The same steps can be followed for uploading from the LAN interface.

[illegible]

D.3 Internal UDP Sender and Receiver for Testing the Satellite Link to the Hub

The internal UDP sender and receiver allows users to send and receive packets between the hub and terminal. The internal UDP sender and receiver is used to check the transfer of packets between the hub and terminal and to check whether there is any packet loss on the network.

The IP UDPSSEND module generates UDP traffic with embedded packet identification so that, at the receiver end, missing packets can be found by looking at the identification. This can be used to check the link issues. UDPSSEND can be configured to work in different ways; UDPSSEND can pump traffic to a single host, multiple hosts, or a range of hosts. UDPSSEND can either continuously pump traffic until explicitly stopped by the user or specified number of packets. The last used configurations will be stored until re-configured explicitly.

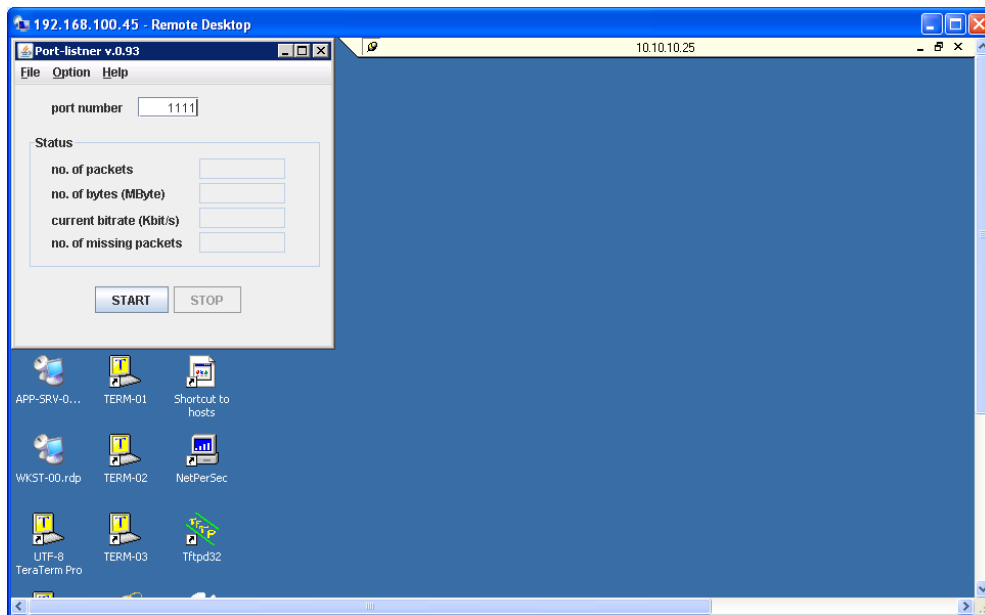


We need to have a UDP listener for the receiver, and in order to have both a UDP sender and a UDP receiver communicate and transfer packets to each other, the port number on the hub and the terminal should be same.

Internal UDP Sender for Testing the Satellite Link to the Hub

For UDP sender testing of the satellite link to hub, follow the below procedure.

1. Before configuring the terminal, make sure to start the port listener and assign a port number. Port number of the listener should be same as that of the terminal.
2. Select Options → View → No packet loss on port listener.



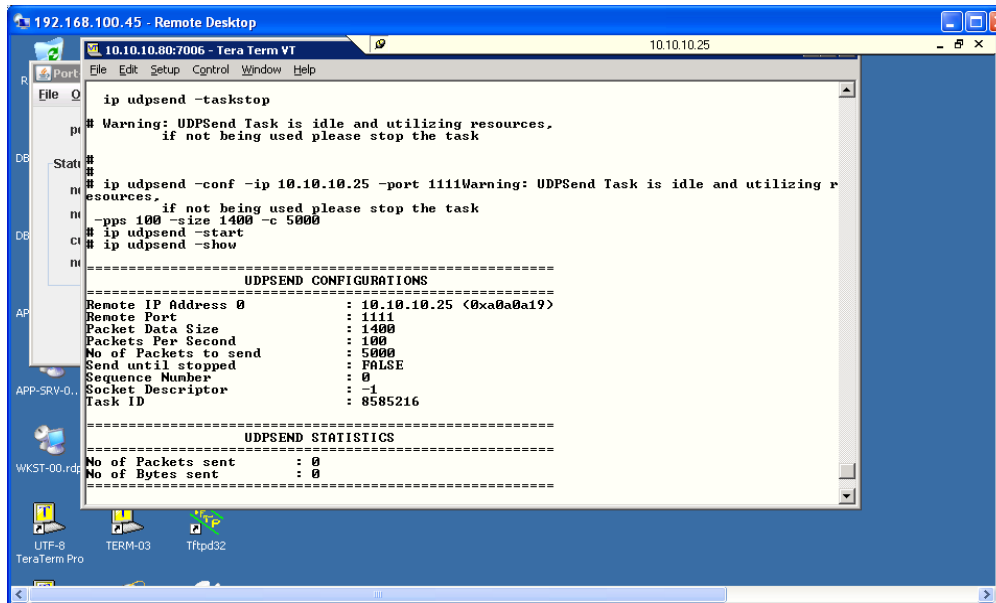


- Configure the UDP sender on the terminal as shown in the following example.

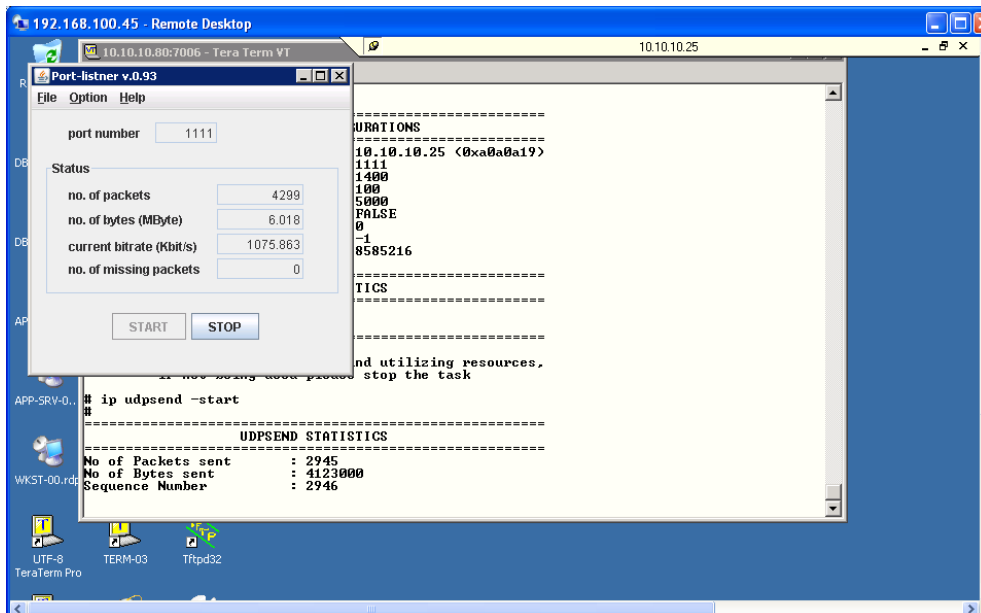
Example:

```
ip udpsend -taskstart
```

```
ip udpsend -conf -ip 10.10.10.25 -port 1111 -pps 100 -size 1400 -c 5000
```



- In order to start sending packets to the port listener, type `ip udpsend -start`. This will start sending the packets as shown below.



UDPSEND will be automatically stopped after counting the number of packets pumped, or else you can stop the packet generator by using the stop command (i.e., you can stop the task using the taskstop command).



Internal UDP Receiver for Testing Satellite Link to Hub

The IP UDPRECV module receives UDP traffic with embedded packet identification. Missing packets can be found by looking at the identification, which can be used to check the link issues. UDPRECV can be configured to work in different ways; it can receive traffic from a single host or two hosts. UDPRECV will receive traffic until explicitly stopped by the user.

UDP Receiver for Testing the Satellite Link to Hub

For UDP sender testing of the satellite link to hub, follow the below procedure.

1. Configure the port sender for IP address, port number, packet size, packets per second, and number of packets to be sent as shown here:

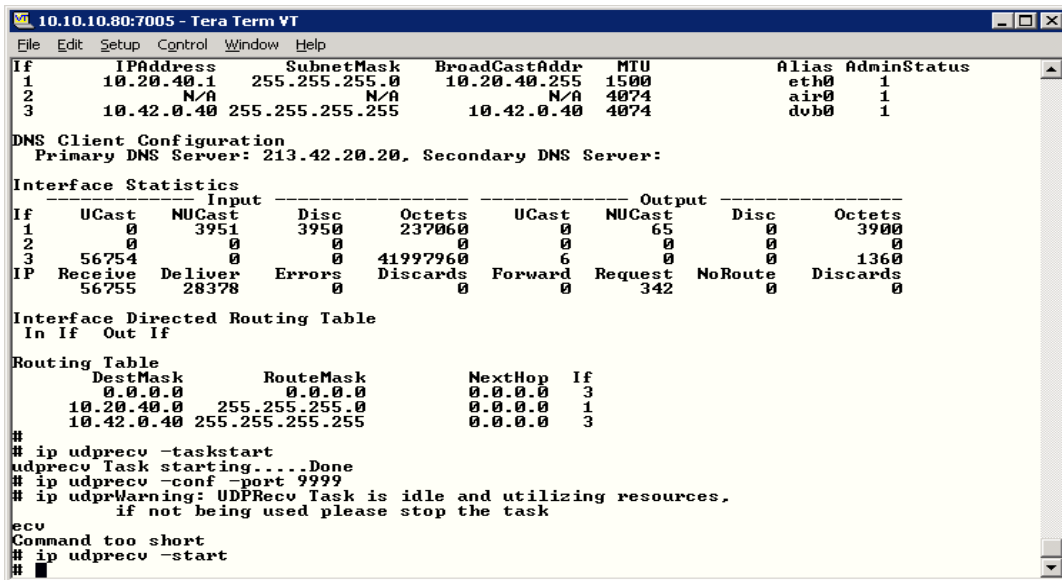
The screenshot shows the 'Port-sender v.0.93' application window. It has several sections:

- Destination:** IP address: 10.20.40.1, port no: 9999.
- Data:** Three radio buttons: 'send from file' (disabled), 'send pattern' (disabled), and 'send sequence number' (selected). There are empty text boxes next to each.
- Send control:**
 - packet size: from 1400 to 1400.
 - packets per second: from 100 to 100.
 - send no of packets: selected radio button, with a value of 5000.
 - send until: disabled radio button.
 - send until stop: disabled radio button.
- Status:**
 - start time: empty text box.
 - no packets sent: empty text box.
 - bytes sent (MByte): empty text box.
 - data rate (KBit/s):
 - min: empty text box.
 - max: empty text box.
 - average: empty text box.
 - current: empty text box.

At the bottom are 'START' and 'STOP' buttons.

2. Start the task on the terminal by typing the command `ip udprecv -taskstart`.
3. Configure the port number on the terminal using the command `ip udprecv -conf -port 9999`.

Make sure that the port number on the terminal is same as that on the port sender.



```

10.10.10.80:7005 - Tera Term VT
File Edit Setup Control Window Help
If IPAddress SubnetMask BroadcastAddr MTU Alias AdminStatus
1 10.20.40.1 255.255.255.0 10.20.40.255 1500 eth0 1
2 0.0.0.0 N/A N/A 4074 air0 1
3 10.42.0.40 255.255.255.255 10.42.0.40 4074 dvb0 1

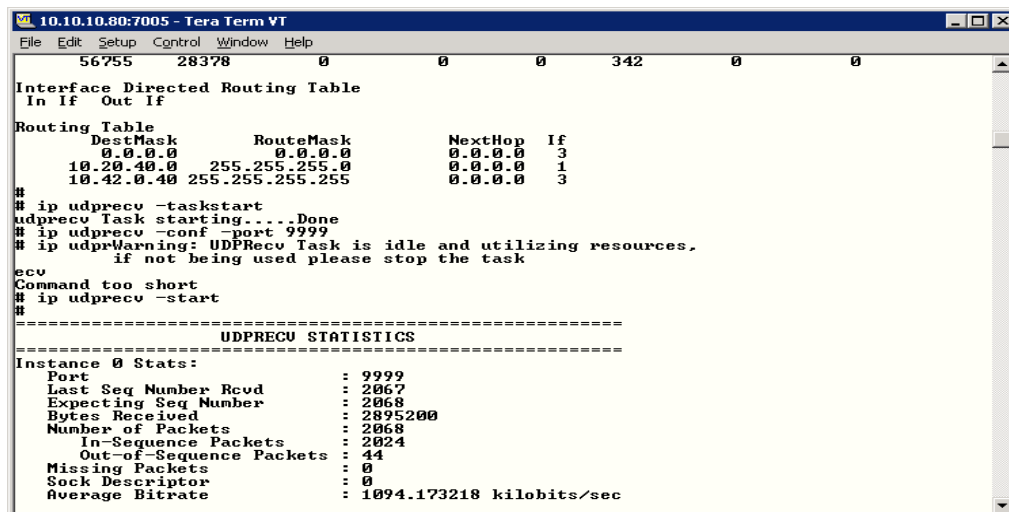
DNS Client Configuration
Primary DNS Server: 213.42.20.20, Secondary DNS Server:

Interface Statistics
-----
If UCast NUCast Disc Octets UCast NUCast Disc Octets
1 0 3951 3950 237060 0 65 0 3900
2 0 0 0 0 0 0 0 0
3 56754 0 0 41997960 6 0 0 1360
IP Receive Deliver Errors Discards Forward Request NoRoute Discards
56755 28378 0 0 0 342 0 0

Interface Directed Routing Table
In If Out If
Routing Table
DestMask RouteMask NextHop If
0.0.0.0 0.0.0.0 0.0.0.0 3
10.20.40.0 255.255.255.0 0.0.0.0 1
10.42.0.40 255.255.255.255 0.0.0.0 3
#
# ip udprecv -taskstart
udprecv Task starting....Done
# ip udprecv -conf -port 9999
# ip udprWarning: UDPRecv Task is idle and utilizing resources,
if not being used please stop the task
ecv
Command too short
# ip udprecv -start
#
  
```

4. Type the command `ip udprecv -start` and click the start button on the port sender to start sending the packets.

To check the statistics and the packet loss between the sender and the receiver, type the CLI command `ip udprecv show`.



```

10.10.10.80:7005 - Tera Term VT
File Edit Setup Control Window Help
56755 28378 0 0 0 342 0 0

Interface Directed Routing Table
In If Out If
Routing Table
DestMask RouteMask NextHop If
0.0.0.0 0.0.0.0 0.0.0.0 3
10.20.40.0 255.255.255.0 0.0.0.0 1
10.42.0.40 255.255.255.255 0.0.0.0 3
#
# ip udprecv -taskstart
udprecv Task starting....Done
# ip udprecv -conf -port 9999
# ip udprWarning: UDPRecv Task is idle and utilizing resources,
if not being used please stop the task
ecv
Command too short
# ip udprecv -start
#
=====
UDPREC STATISTICS
=====
Instance 0 Stats:
Port : 9999
Last Seq Number Rcvd : 2067
Expecting Seq Number : 2068
Bytes Received : 2895200
Number of Packets : 2068
In-Sequence Packets : 2024
Out-of-Sequence Packets : 44
Missing Packets : 0
Sock Descriptor : 0
Average Bitrate : 1094.173218 kilobits/sec
  
```



Appendix E. Management via SNMP

The VSAT can be monitored and managed using the standardized Simple Network Management Protocol (SNMP).

The management information that can be collected and controlled by an SNMP management application is contained in Management Information Databases (MIBs). The VSAT supports two such MIBs:

- MIB-II (relevant parts)
- STM proprietary DVB-RCS MIB

MIBs are components in the Internet Engineering Task Force (IETF) defined Structure of Management Information (SMI) and relevant information can be found at www.ietf.org. SMI version 2 as defined by IETF STD58 is supported.

E.1 SNMP Version Compliance

The SatLink VSAT supports SNMP version 2c as defined by IETF in RFC 1901 and RFC 3417.

In accordance with SNMPv2c, the access rights associated with the attached community name is checked when an SNMP message arrives. The predefined access rights for the given community name, together with the predefined maximum access rights of the object ID(s) addressed by the SNMP message, determines the effective access rights. The VSAT is also equipped with optional enhanced SNMP access control as described later.

The VSAT does not support traps.



E.2 MIB-II

The VSAT supports relevant parts of MIB-II (RFC1213). The following object groups of MIB-II are supported:

- System
- Interface
- IP⁷
- ICMP
- UDP

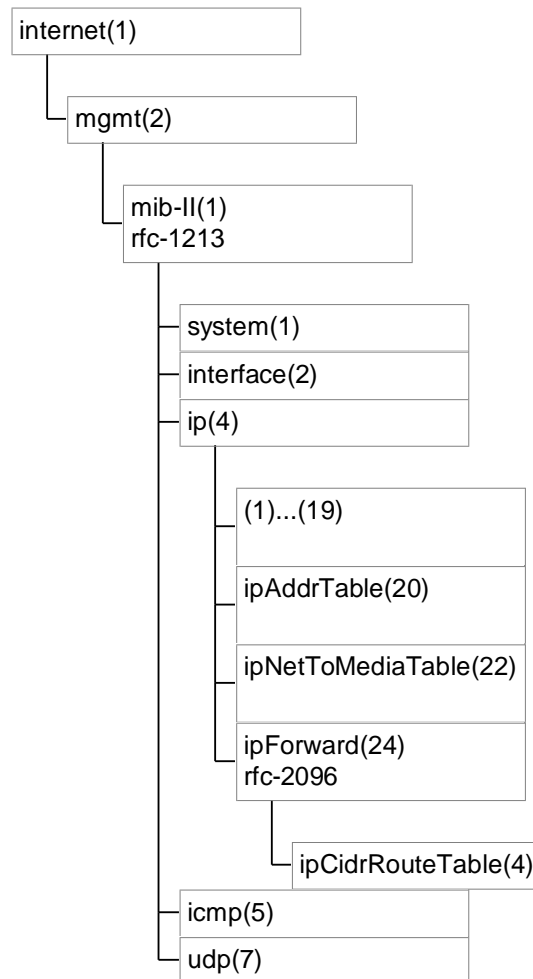
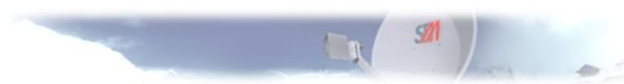


Figure 47: Supported Parts of MIB-II

⁷ ipRouteTable and ipRoutingDiscards are not supported, ipForward.ipCidrRouteTable (RFC2096) is supported instead



E.4 Access Policies

Access to the VSAT's MIBs is limited as follows: first by a restriction based on community name and maximum access right combination, and then optionally by the SNMP request's source IP address and net mask and/or source interface.

When only community name and maximum access rights limit the access, filtering in the VSAT is achieved by checking the SNMP message's community name and maximum access rights only. Otherwise, the source IP address, net mask, and/or source interface of the SNMP message are also checked. If all these parameters of the SNMP message match the values stored in the MIB object that controls the access rights, the SNMP message is processed. Otherwise it is discarded.



The factory default configuration of the VSAT is to have configured a read-only community named PUBLIC that is accessible from all IP addresses and interfaces. Please note that this default community is only available when there are no other communities defined.

E.4.1 CLI commands for Configuring SNMP Access

CLI Commands	User Privilege Level
device snmp community <name> <ro rw> [<ipaddr> <mask>]	1
device snmp delcommunity <name>	1
device snmp show	1
device manager add snmp <func> <if> [<ip> <mask>]	1
device manager del snmp <func> <if> [<ip> <mask>]	1
device manager show	1
device manager httpport <port>	1



In order to use the device snmp and device manager CLI commands one has to be logged in as a user with privilege level 1 (the root user).

E.4.2 Access Configuration

In order to access the VSAT MIB, it is necessary to configure both the VSAT and the MIB browser application.

1. The MIB browser application has to be configured with the correct community name both for read access and write access.
2. The VSAT's SNMP access list has to be configured via CLI, using the device snmp community command and optionally the device manager add snmp command. It is not possible to carry out this configuration via the web management interface of the VSAT.

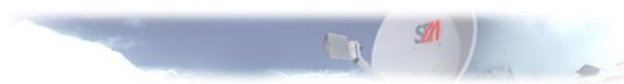
Example 1:

Define an access type with the name "public", with read-write maximum access rights and with no restriction on the SNMP request's IP address and net mask.

```
# device snmp community public rw
# device snmp show
```

SNMP management access:

Community String	Access	IpAddress	Subnet
public	Read/Write	0.0.0.0	0.0.0.0



Example 2:

Define an access type with the name “user”, with read-only maximum access, and with restriction to the 10.10.20.0 sub-net for the SNMP request source.

```
# device snmp community user ro 10.10.20.0 255.255.255.0
# device snmp show
```

SNMP management access:

Community String	Access	IpAddress	Subnet
normal-user	Read only	10.10.20.0	255.255.255.0
public	Read/Write	0.0.0.0	0.0.0.0

Example 3:

Remove the access type with the name “user”.

```
# device snmp delcommunity user
# device snmp show
```

SNMP management access:

Community String	Access	IpAddress	Subnet
public	Read/Write	0.0.0.0	0.0.0.0

Example 4:

Only allow SNMP access from subnet 10.10.10.0/255.255.255.0 via the satellite interface.

```
# device manager add snmp 3 10.10.10.0 255.255.255.0
# device manager show
```

Management access:

Access	Interface	IpAddress	Subnet
SNMP	3	10.10.10.0	255.255.255.0

E.5 Setting a MIB Object and Saving the Configuration

When the VSAT is shipped from the factory, the essential MIB objects of the VSAT MIB are given default values.

When changing the value of a MIB object with write access, the new value will generally be activated when they are set. The value will apply as long as the VSAT is powered on. If no special action is taken to save the new MIB value, the value will revert to the default value upon power-on.

To save a new value so that it will survive a VSAT power off/on, one must explicitly issue a MIB save command by setting the MIB object sysCmdSaveConfig to 1.



Saving the configuration can take up to 20 seconds.

E.6 Definition of VSAT Interface Numeration

This section provides the background for the chosen numbering of the interfaces of the VSAT.

The VSAT has two interfaces:

- The Ethernet (LAN) interface
- The satellite (DVB) interface

The Ethernet (LAN) interface of the VSAT has been assigned the number 1 and the Air (DVB) interface has been given the number 3. Interface number 2 is not in use.

These interface numbers are predefined and automatically configured in the RCST.

E.7 Adding an Entry to the QoS Classification Table



CreateAndGo is not available when adding a new entry to the ipQos.qos Classification Table. Instead a new row must first be created as CreateAndWait before being activated as shown in the example below.

E.7.1 Example - Configure an Entry in the QoS Classification Table Using MGSoft MIB Browser v9.0.0.

1. Add an entry in the table by using set on the qosClassRowStatus. Then set the value to 5 (CreateAndWait) for the OID 1.3.6.1.4.1.3286.50.2.5.5.1.1.14.N, where N is the index desired for the new entry (index 3 in the example below).

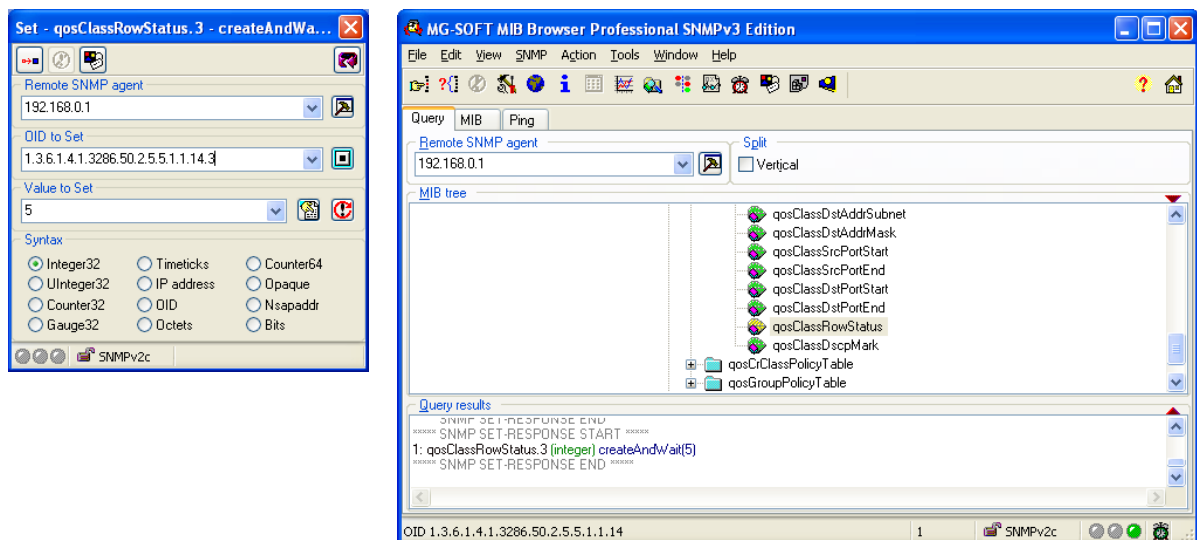


Figure 49: Define a New Row as CreateAndWait



To verify that the entry is correctly created, the CLI command `ip qos show` may be used:

```
# ip qos show
QoS Policy Table
Grp Cls CrM Pri QLength Drop Timeout Description
  0   0   0   0  400000    0    120 Best Effort
  1   1   1   1   15000    1    120 VoIP Audio
  2   1   1   2    4000    1    120 VoIP Signaling
QoS Classification table
SubIdx Idx Grp Classification Parms HitCount
#
```

2. Then use, for example, “Table View” on the `qosClassificationEntry` object and edit the table. Commit the table to the VSAT.

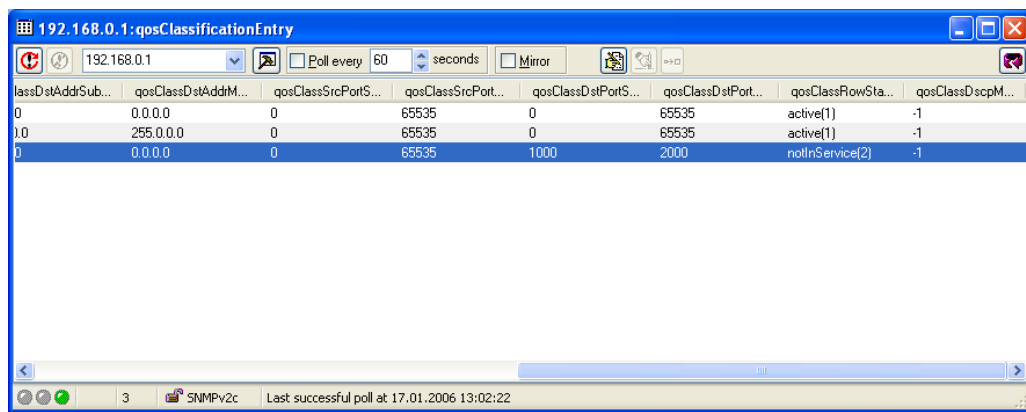
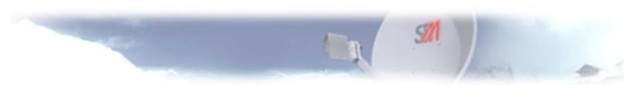


Figure 50: Editing the Entry Using "Table View"

The figure above shows an example for filtering on destination ports from 1000-2000. The entry can be verified using the CLI command `ip qos show`:

```
# ip qos show
QoS Policy Table
Grp Cls CrM Pri QLength Drop Timeout Description
  0   0   0   0  400000    0    120 Best Effort
  1   1   1   1   15000    1    120 VoIP Audio
  2   1   1   2    4000    1    120 VoIP Signaling
QoS Classification table
SubIdx Idx Grp Classification Parms HitCount
```



3. Then activate the entry:

lassDstAddrSub...	qosClassDstAddrM...	qosClassSrcPortS...	qosClassSrcPort...	qosClassDstPortS...	qosClassDstPort...	qosClassRowSta...	qosClassDescpM...
0	0.0.0.0	0	65535	0	65535	active(1)	-1
1.0	255.0.0.0	0	65535	0	65535	active(1)	-1
0	0.0.0.0	0	65535	1000	2000	active(1)	-1

Figure 51: Activating the Entry in the QoS Classification Table



Appendix F. ODU Installation

The ODU comprises the antenna with feed-horn and mounting structure, and a transceiver that contains the LNB integrated with OMT, TX-reject filter, and the transmitter (BUC). If the SatLink 4033/4035 transceiver is not used, the OMT, LNB and BUC may be supplied as two or three separate units. Two cables with F-connectors, one for TX and one for RX, are connecting the ODU to the IDU.



Figure 52: SatLink 4033/4035 Configuration

F.1 Assembly of SatLink 403x Transceiver to Feed Horn

The SatLink 403x is supplied with 6 pieces of UNC 6/32 for connection to the antenna flange. The parts are shown in the picture below. Please refer to Appendix G for information of how to connect the SatLink 403x to antenna feed horn interfaces with 6 or 8 M4 screws.



Figure 53: SatLink 4033/4035 and Screws for Mounting Feed Horn

When mounting the transceiver to the antenna horn, place the feed horn on a level surface and insert the O-ring supplied with the antenna feed horn into the groove as shown below:



Figure 54: Inserting O-ring into Feed Horn Groove

Place the transceiver on to the feed horn and insert one of the UNC screws for alignment. Tighten the screw loosely by hand or with an Allen key. Make sure that the rubber gasket is not removed from the groove when doing this.



Figure 55: Mounting Feed Horn

Insert the remaining screws and tighten firmly with an Allen key. Always use screws from the mounting kit supplied with the SatLink 4033/4035 (part no. 105773). Do not use other screws or apply washers!



Figure 56: Tightening with Allen Key

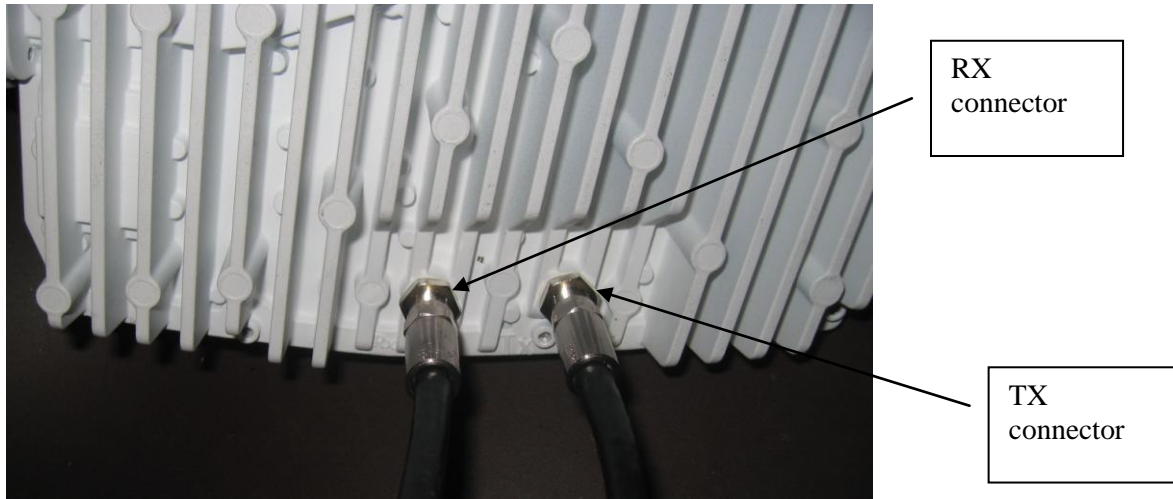


Figure 57: Connecting Cables from IDU

The IF connectors are placed in the chassis of the SatLink 403x. A protrusion on the case indicates ‘RX’ and ‘TX’ so that they are easily distinguishable. Cable connectors should be tightened firmly, but use of excessive force may damage the F-connectors on the transceiver.

F.2 Assembly and Installation of the Antenna

Different mounting structures for antennas are shown below. From the left side, we have an L-shaped wall-mount, a three-leg mount, and a standard straight mount. The tube diameter is 76 mm. For a correct mounting, the surface must be vertical or horizontal, respectively.



Non-penetrating roof-mounting structures (requiring no screws or bolts) may also be used if the customer does not want to penetrate the roof. The foot can be rectangular, “H-shaped” or have another suitable form. It must be loaded with at least 75 kg depending on the antenna size and maximum wind force.

Install the antenna and adjust pointing and polarization as described in the antenna manufacturer’s installation instructions. After connecting the cables from the IDU to the transceiver (or BUC/LNB/OMT) and completing the installation of the antenna with feed horn and transceiver (or BUC/LNB/OMT), proceed with fine adjustment of antenna pointing and polarization assisted by the IDU as described in section 9.3.



Finally, the F-connectors must be protected against rain and humidity. Use a self-vulcanizing tape suitable for outdoor use. The cables must also be properly marked and should be strapped to the antenna feed mount.



Figure 58: Complete Assembled ODU with Cables Strapped to Antenna Feed Mount



Important: Do not use amplifiers or attenuators on the TX-cable.



Use type “F” connectors for the cables.



The cable pulling from the ODU to the IDU must be performed according to the customer. Sharp bends on the cables must be avoided (see figure below).

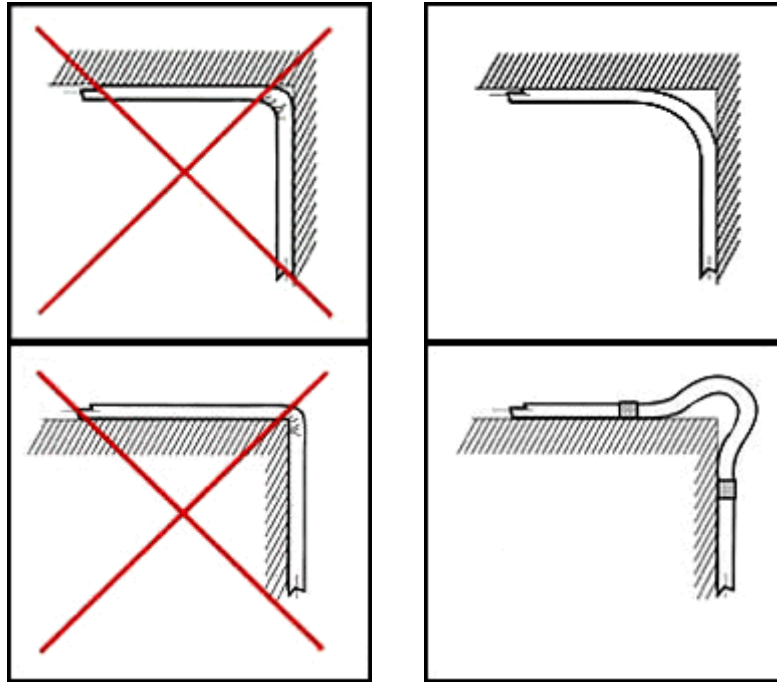
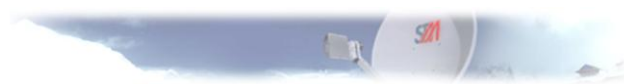


Figure 59: Avoiding Sharp Bends on Cables



Appendix G. SatLink 403x: Interfacing VSAT RX/TX Antennas

The SatLink 403x series of Ku-band transceivers is configured with internal OMT as shown in Figure 60 below. The output interface of the transceiver (C120) is therefore connected directly to the feed horn of the antenna.

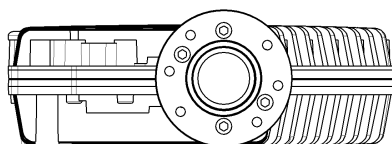


Figure 60: SatLink 403x Output Interface (Option A)



Antenna vendors offer different variants of the feed horn for their Ku-band RX/TX antennas. The different options are listed below.

Option	Feed Horn Interface
A	C120 – 6 UNC screws
B	C120 – 6 or 8 M4 screws

Option A interfaces the SatLink 403x directly, while Option B requires an adaptor in order to fit the SatLink 403x output interface. The hole patterns for option A and B are shown in Figure 61 and Figure 62.

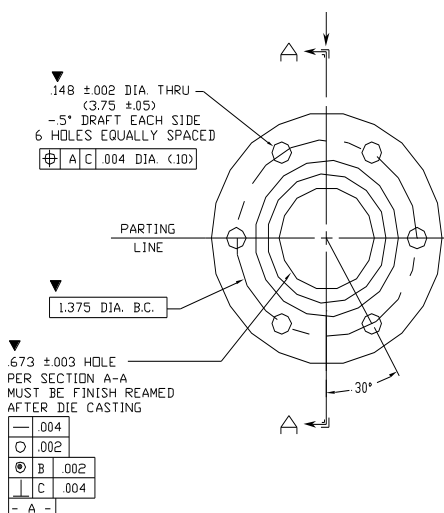


Figure 61: Option A Antenna Feed Hole Pattern. Holes are distributed equally at 60 degrees apart. The SatLink 403x fits directly to this pattern using 6 UNC screws for fastening.

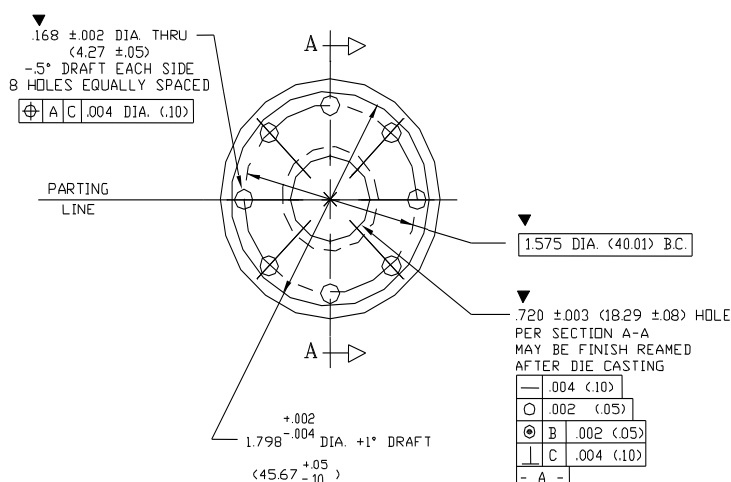


Figure 62: Option B antenna Feed Hole Pattern. Holes are equally distributed at 45 degrees apart. Some versions have only 6 holes. SatLink 403x fits on this pattern by means of adapter SatLink 4901 (STM P/N 107268).

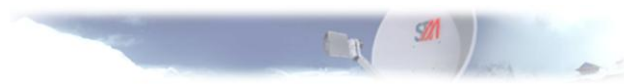


An overview of different antennas that can be used with the SatLink 403x is given in the table below. The table shows which feed horn hole pattern (option A or B) the antenna is configured with, and whether an adapter is required for mounting the SatLink 403x to the antenna feed horn. The STM SatLink 4901 adapter, having STM P/N 107268, can be ordered from STM.

Manufacturer	Antenna Model	Description	Feed horn interface option	Ant. Size	Manufacturer's P/N	Adapter required	Eutelsat	Ana-tel
Andrew	Type 960 Class I	Single offset	A	0.96 m	62-96051-02	No	x	x
Andrew	Type 960 Class I	Single offset	B	0.96 m	62-96052-11	STM SatLink 4901	x	x
Andrew	Type 960 Class II	Single offset	A	0.96 m	62-96055-02	No	x	x
Andrew	Type 960 Class II	Single offset	B	0.96 m	62-96056-01	STM SatLink 4901	x	x
Andrew	Type 123 Class I	Single offset	A	1.20 m	62-12351-02	No	x	x
Andrew	Type 123 Class I	Single offset	B	1.20 m	62-12356-11	STM SatLink 4901	x	x
Andrew	Type 123 Class II	Single offset	A	1.20 m	62-12355-02	No	x	x
Andrew	Type 123 Class II	Single offset	B	1.20 m	62-12362-01	STM SatLink 4901	x	x
Andrew	Type 184	Dual Optics	B	1.80 m	62-18452-02	STM SatLink 4901	x	
Andrew	Type 184 Class III	Single offset	B	1.80 m	62-18356-01C	STM SatLink 4901		x
Andrew	Type 244	Dual Optics	B	2.40 m	62-24452-02	STM SatLink 4901	x	
Andrew	Type 244 Class III	Single offset	B	2.40 m	62-24356-01C	STM SatLink 4901		x
Patriot	TXFCC-084EL	Single offset	A	0.84 m		No		
Patriot	TXFCC-090KU	Single offset	A	0.90 m		No		
Patriot	TX-INT100KU	Single offset	A	1.00 m		No		
Patriot	TX-EUT100KU	Dual Optics	A	1.00 m		No	x	
Patriot	TX-INT120KU	Single offset	A	1.20 m		No		
Patriot	TX-EUT120KU	Dual Optics	A	1.20 m		No	x	
Patriot	TX-EUT180KU	Dual Optics	A	1.80 m		No	x	
Patriot	TX-INT-240	Batwing	A	2.40 m		No		
Prodelin	1132	Single Offset		1.2m				
Prodelin	1184	Single Offset		1.8m				
Prodelin	1250	Single Offset		2.4m				
Visiosat				0.75m				
Visiosat	KIT 90 EMIT	Single offset	A	0.90 m	0141088	No	x	
Visiosat	KIT 120 EMIT	Single offset	A	1.20 m	0141143	No	x	
Seatel	4003	Automatic Polarization Control		1.0				
Seatel	2406	Orthogonal Linear Polarized		0.6m				
Seatel	4006	Linear Cross-Pol and Co-Pol		1.0m				
Seatel	6006	Linear Cross-Pol or Co-Pol		1.5m				

Table 22: STM Supported Ku-band Antennas and Feed Interfaces

Antennas with feed horn interface option B are often delivered with an OMT mounted on the feed horn. The OMT is not needed when using the SatLink 403x. Remove the OMT and insert the SatLink 4901 adapter (STM P/N 107268) as described in Appendix G.1.



G.1 Mounting the Feed Horn Interface Adapter on the SatLink 403x

Antenna feeds with option B hole patterns will require use of the SatLink 4901 adapter kit (STM P/N 107268) for interfacing the SatLink 403x. Use the following procedure:

1. Insert the rubber gaskets supplied with the adapter on both sides of the adapter.
2. Use the 4 UNC screws to fasten the adapter to the SatLink 403x flange as shown in Figure 63.
3. Fasten the SatLink 403x to the antenna feed horn as shown in Figure 64.

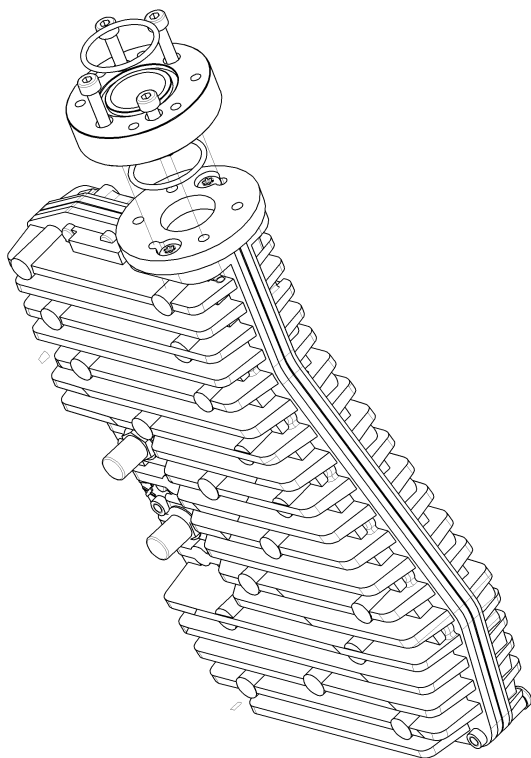


Figure 63: Mounting of SatLink 4901 (STM P/N 107268) on SatLink 403x. Remember to fit rubber gasket on both sides of the adapter to prevent moisture intrusion. Fasten the adapter using 4 UNC screws supplied with the SatLink 403x. Hand tighten with Allen key.

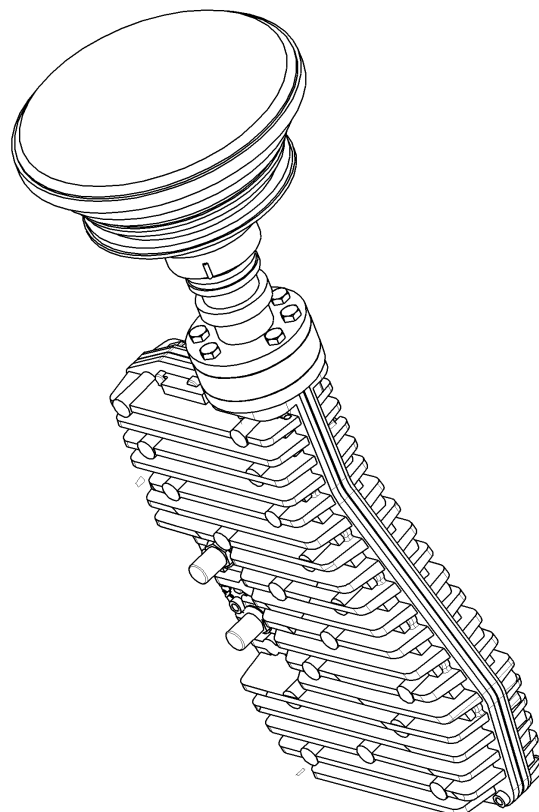


Figure 64: Mount the antenna feed to the adapter and fasten using M4 screws.

G.2 Upgrading Existing VSAT Installations

When upgrading an existing VSAT site from a configuration with an antenna listed in Table 22 to a DVB-RCS site configured with the SatLink 403x transceiver, the antenna will normally be configured with a feed horn with the option B hole pattern (Figure 62) and an OMT. In order to fit the SatLink 403x to the antenna from the VSAT installation, do the following:

1. Remove the OMT. This part is not used when installing the SatLink 403x transceiver.
2. Use the adaptor SatLink 4901 (STM P/N 107268) to interface the SatLink 403x to a feed horn with interface C120 / 4 screws as shown in Figure 63 and Figure 64.

Alternatively, feed horns (Andrew P/N 61-00233-01) with interface option A for Andrew 96 cm and 1.2 m antennas can be ordered separately.



Appendix H. Manual Configuration of Parameters Normally Configured Automatically from the Hub

This Appendix explains how to configure manually using the CLI parameters that for most SatLink systems are configured automatically by the Hub NMS when the SatLink VSAT enters the network for the first time.



Do not configure any of these parameters manually unless being instructed to do so by the Hub operator, as wrong configuration may break IP connectivity for the SatLink VSAT.

H.1 IP Address Configuration

The Hub operator manages all IP addresses in the system including the DVB interface IP address and the LAN IP addresses of all VSATs. The IP addresses are normally set automatically in the VSAT by the Hub operator when the VSAT logs on to the network for the first time, but can be configured manually as well. Below is described the procedure for manual configuration of IP addresses.

Please make sure that the IP addresses and net masks are entered exactly as specified by the Hub operator, as any deviation may result in loss of communication with the IP network.

1) Set the LAN IP address of the unit

- Enter the CLI command `ip set 1 <aaa.bbb.ccc.ddd> <eee.fff.ggg.hhh>`
where `<aaa.bbb.ccc.ddd>` is the IP address and `<eee.fff.ggg.hhh>` is the net mask.

Example:

```
# ip set 1 10.10.20.1 255.255.255.248
```

2) Set the DVB IP address (Satellite interface) of the unit:

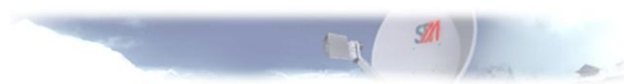
- Enter the CLI command `ip set 3 <aaa.bbb.ccc.ddd> <eee.fff.ggg.hhh>`
where `<aaa.bbb.ccc.ddd>` is the IP address and `<eee.fff.ggg.hhh>` is the net mask.

Example:

```
# ip set 3 10.10.21.1 255.255.255.0
```

3) Verify that the IP addresses and net masks are set correctly:

- Enter the CLI command `ip show`



Example:

If the values above have been configured, the `ip show` command will give the following result (interface 1 is the LAN interface, interface 2 is not used, and interface 3 is the DVB (satellite) interface):

```
#
ip show
Interfaces
If      IPAddress      SubnetMask      BroadCastAddr    MTU      Alias
AdminStatus
1      10.20.42.1      255.255.255.0    10.20.42.255    1500      eth0      1
2      N/A             N/A             N/A             4074      air0      1
3      10.42.0.42     255.255.255.255  10.42.0.42      4074      dvb0      1
```

DNS Client Configuration

Primary DNS Server: 213.42.20.20, Secondary DNS Server:

Interface Statistics

```
----- Input ----- Output -----
If      UCast      NUCast      Disc      Octets      UCast      NUCast      Disc      Octets
1      4354      7226      6060      831931      103      99      0      18381
2      0      0      0      0      0      0      0      0
3      696      0      0      66518      5038      0      0      389150
IP  Receive  Deliver  Errors  Discards  Forward  Request  NoRoute  Discards
      5797      1379      0      0      4418      805      0      4
```

Interface Directed Routing Table

In If Out If

Routing Table

DestMask	RouteMask	NextHop	If
0.0.0.0	0.0.0.0	0.0.0.0	3
10.20.42.0	255.255.255.0	0.0.0.0	1
10.42.0.42	255.255.255.255	0.0.0.0	3

4) Save the IP configuration to Flash memory

– Enter the CLI command: `save config`

Example:

```
# save config
Saving Configuration. This will take ~20 secs
# Configuration Saved

#
```

If the prompt sign (#) does not show, press <ENTER>.

H.2 DNS Configuration

The DNS server the SatLink VSAT uses is normally configured automatically by the SatLink Hub. For a system where this is not done, the primary and, optionally, secondary DNS server IP addresses can be configured using the CLI command `ip dns server`.



Example:

```
# ip dns server 10.10.10.10 10.10.10.11
# ip dns show
DNS Client Configuration
  DNS Server      Sent   Received
10.10.10.10      174      0
10.10.10.11      174      0
#
```

The example above shows how the SatLink DNS client is configured to use the DNS servers 10.10.10.10 and 10.10.10.11.

Note that when the internal SatLink DHCP server is enabled, the SatLink VSAT will configure the hosts on its LAN to use the SatLink VSAT as the primary DNS server, and its own DNS client's primary DNS server as the secondary DNS server. This is done in order to let the hosts use the DNS Forwarder of the SatLink VSAT to reduce the time for DNS lookups and especially improve the speed of Web browsing.

H.3 Configuration of the DHCP Server

To handle automated address assignment, the IETF has designed a protocol (RFC 2131) known as Dynamic Host Configuration Protocol (DHCP). DHCP allows a computer to acquire automatically all IP configuration information it needs when entering the network.

Whenever a new computer connects to the VSAT's LAN and the DHCP server in the VSAT is enabled for one of its LAN interfaces (LAN or Virtual), the computer will be allocated an IP address by the DHCP server from the pool of addresses defined by the VSAT LAN (or Virtual) subnet.

IP addresses that will not be allocated automatically to new computers are the VSAT's own IP address and eventually IP addresses specifically excluded during configuration.

The VSAT administrator has the possibility to configure the following parameters:

- *Server Status:* Enable or disable the VSAT LAN DHCP server.
- *Lease time:* Set the lease time for an IP address allocated to a host on the LAN.
- *No. of IP addresses excluded:* Specifies the number of IP addresses to be excluded from the available range of addresses defined by the VSAT LAN (or Virtual) subnet. The excluded range of IP addresses will be the upper range of the LAN (Virtual) subnet; i.e., if the VSAT LAN is allocated the IP addresses 10.10.10.1 to 10.10.10.254, and 2 IP addresses are excluded for use by the DHCP server, then the DHCP server will have the IP address range 10.10.10.1 to 10.10.10.252 available for DHCP clients.

The DHCP server in the SatLink VSAT is enabled in the factory default configuration. To disable the DHCP server, use the CLI command `ip dhcp disable`.

The lease time of IP addresses can be configured using the CLI command `ip dhcp leasetime`.

Example:

```
# ip dhcp leasetime 1 d
```

The command in this example will configure the lease time to 24 hours (one day).

To view the DHCP server configuration and, if enabled, the DHCP client table, use the CLI command `ip dhcp show`.

Example:

```
#
```



```
ip dhcp show
```

DHCP Server Status

```
-----
Server Status           : Enabled
Server IP address       : 10.20.42.1
Server IP address range :
    Starting IP address : 10.20.42.2
    Ending IP address   : 10.20.42.254
No of IP addresses excluded : 3
Excluded IP address range :
    Starting IP address : 10.20.42.252
    Ending IP address   : 10.20.42.254
Lease Time               : 1 Hour 32 Minutes 35 Seconds
Primary DNS server       : 10.20.42.1
Secondary DNS server     : 213.42.20.20
```

DHCP Client Table

```
-----
Host Name      IP Address      HW MAC Address      Lease expires
TERMINAL-06    10.20.42.2      1 00:1f:29:3e:e6:e9 Mon Feb 23 12:42:55 2009
```

The DHCP client table is only displayed when the DHCP server is enabled. The table will display the host name, the allocated IP address, the host MAC address, and the address' lease expiration time for each computer registered by the DHCP server.



Until the VSAT has acquired a lock on the Forward Link and received the system time via the Time and Date Table (TDT) from the Hub, it will have no information of the current time. The DHCP server will in this situation only lease IP addresses to the LAN hosts for 15 minutes until the system time is set. The message *Lease expires in less than 15 minutes* will be displayed in the DHCP client table.

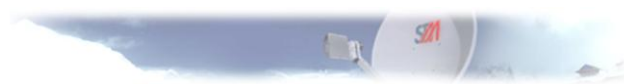
H.3.1 Changing the SatLink VSAT LAN Interface IP Address

If the IP address of the SatLink VSAT LAN Interface is changed, the IP addresses of all end-user devices that are connected to the SatLink VSAT LAN must be updated correspondingly.

This also applies to those end-user devices that have obtained their IP addresses automatically from the DHCP server. As the end-user devices will not normally issue a request to the DHCP server before the lease-time of their IP addresses has expired, an IP address update of these devices must be manually triggered by the end-user.

For example, to trigger a PC running Microsoft Windows OS to request a new IP address from the DHCP server, the end-user can issue the command *ipconfig /renew* in the DOS command window.

If the end-user device does not have provisioned means for manually triggering a DHCP request for IP address update, please power off and on again the end-user device. This will normally result in the end-user device requesting the VSAT DHCP server for an IP address as part of the end-user device initialization process.



Appendix I. IDU Power Calibration and P1dB Configuration with BUCs Other Than the SatLink 403x

The VSAT can be used together with various 3rd party BUCs for C-, Ku-, Ka-, and EHF-band. These BUCs do not support DiSEqC communication and do not have a power detector to measure the actual output power from the HPA. A more complicated procedure to calibrate the TX output power and configure the P1dB must then be run as described below.

I.1 Calibrating the IDU Output Power

This section describes how to calibrate the TX output power when using 3rd party BUCs without support for DiSEqC and an integrated power detector. Please refer to section 6.4.2 for the description of the calibration procedure for the SatLink 403x.

Ensure that the VSAT configuration procedure in section 6.2 has been performed.

Ensure that the VSAT is configured to start the receiver (RX) automatically, but not the transmitter (TX).

Enter the CLI command `dvb rx autostart on` to enable receiver automatic start.

Enter the CLI command `dvb tx autostart off` to disable transmitter automatic start.

Enter the CLI command `dvb rx show`. Verify that the parameter `Auto start` is set to `Enabled`.

Enter the CLI command `dvb tx show`. Verify that the transmitter is `Off` and the parameter `Auto start` is set to `Disabled`. If the transmitter is `On`, use the command `dvb tx logoff`.

Enter the CLI command `save config` to save this configuration.

Ensure that the TX and RX cables from the VSAT to the ODU are connected.

Restart the SatLink VSAT (issue the CLI command `restart`), wait until the application has loaded and the VSAT has locked to the received carrier. The receiver has successfully acquired the Forward Link when the message `Forward Link up` is displayed (see section 9.3.1 for further details).

Log on as the *install* user (user = install, factory default password = dvbrcs).

Call the control center and have contact by phone for the following measurements.

Set up a continuous wave (CW) with the following command:

```
dvb tx cw on <pow> <freq>
```

The variables `pow` and `freq` are defined as follows:

`pow` = TX IDU output power level in dBm.

This is an integer in the range -30 to 0. (Start with `pow` = -30)

`freq` = transmitted radio frequency in kHz. The frequency is only required the first time the CW is turned on. Subsequent adjustment of the power level can be done without entering the frequency.

Example:

```
dvb tx cw on -30 14100000
```

The above example will transmit a CW from the ODU output at 14.1 GHz with an IDU output power level of -30 dBm from the VSAT.



Please check immediately with the control center if they can detect the transmitted CW. If they are not able to see the CW at the specified frequency and expected output power level, please power off the VSAT immediately.



The operator control center will instruct you to adjust your power in positive or negative steps. Never make power adjustment steps larger than 5 dB. Please update the transmitted power level using the above `dvb tx cw on` command until the desired power level is measured at the control center.

When the operator confirms that the correct power level has been reached, turn off the CW transmission with `dvb tx cw off` before storing this power level as the nominal IDU output power level to be used for transmission. Type the CLI command:

```
dvb tx outpow <pow>
```

where "pow" is the TX IDU Output Power level in dBm.
Verify the setting by issuing the following CLI command:

```
dvb tx show
```

Save the setting by issuing the following CLI command:

```
save config
```

In the following example, a complete power correction routine is carried out.

Example:

```
dvb tx cw on -30 14100000
```

The operator instructs you to increase power by 5 dB (i.e. $\text{pow} = -30 + 5 = -25$). Type:

```
dvb tx cw on -25
```

The operator instructs you to decrease power by 3 dB. (i.e. $\text{pow} = -25 - 3 = -28$). Type:

```
dvb tx cw on -28
```

The operator instructs you to increase power by 1 dB. (i.e. $\text{pow} = -28 + 1 = -27$). Type:

```
dvb tx cw on -27
```

The operator confirms that the correct power setting is obtained. Confirm the nominal power setting by storing this power level. To configure the nominal power level, turn off the CW transmission with:

```
dvb tx cw off
```

Then type the CLI command:

```
dvb tx outpow -27
```

Verify the setting by issuing the following CLI command:

```
dvb tx show
```

Save the setting by issuing the following CLI command:

```
save config
```



I.2 Configuring P1dB (End of Linear Range)

This section describes how to configure the P1dB (end of linear range) for 3rd party BUCs (without support for DiSEqC and an integrated power detector) to avoid entering in saturation when up link power control is enabled.



A BUC maintains a constant linear gain for low-level input signals. However, at higher input levels, the amplifier enters in saturation and its gain decreases (becoming non-linear). The P1dB (1 dB compression point) indicates the power level that causes the linear gain to drop by 1 dB, as indicated in the following formula:

$$\text{P1dB}_{\text{[Output]}} = \text{P1dB}_{\text{[Input]}} + \text{Linear Gain} - 1 \text{ dB}$$

Check with your Hub operator for the procedure to be used to determine the P1dB compression point of the 3rd party BUC (the procedure could be similar to the one described above for the calibration of the output power). The P1dB will be associated to a certain TX IDU output power, then to avoid the BUC entering in saturation, that associated TX IDU output level must be configured as the “IDU Max Output Power”.

Configure the P1dB using the CLI command:

```
dvb tx outpow -max <pow>
```

where “pow” is the TX IDU Output Power level in dBm associated to the P1dB.



The IDU will limit its Max Output Power to the “pow” value configured above.

Verify the setting for “IDU Max Output Power” is “pow”, by issuing the following CLI command:

```
dvb tx show
```

Save the setting by issuing the following CLI command:

```
save config
```

Example:

Let’s consider the P1dB is associated to a TX IDU Power Level of -8 dBm, then type the CLI command:

```
dvb tx outpow -max -8
```

Verify the setting for “IDU Max Output Power” is -8 dBm by issuing the following CLI command:

```
dvb tx show
```

Save the setting by issuing the following CLI command:

```
save config
```

More Examples:

<code>dvb tx outpow -5</code>	sets IDU Output Power to -5 dBm
<code>dvb tx outpow -12</code>	sets IDU Output Power to -12 dBm
<code>dvb tx outpow -max -1</code>	sets IDU Max Output Power to -1 dBm
<code>dvb tx outpow -max -3</code>	sets IDU Max Output Power to -3 dBm



Appendix J. The Boot SW

The VSAT has two SW applications installed:

- 1) Boot
- 2) DVB-RCS Application

The Boot SW is stored outside the file system and can be compared with the BIOS and MS-DOS on a PC. It is used to have access to the file system and the LAN when there is no application loaded on the VSAT.

The Boot SW is always loaded after powering on the VSAT. But normally the user need not care about the boot SW since the DVB-RCS application is loaded by default.

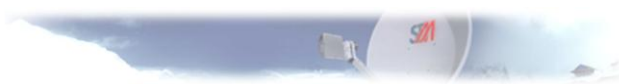
The boot-loader can only be accessed via RS-232 as described in Appendix A. After power on, an output similar to this is displayed on the HyperTerminal:

```
Boot-loader
- SW ID 120044, Revision 14.0.0
File system initialized
Press return to enter boot-loader
```

In order to log on and use the boot SW, press return (the software will wait 10 seconds before automatically loading the DVB-RCS application):

1. When Login is displayed type the user name `install`
2. When Password is displayed type `dvbrcs`

In the boot-loader a minimal CLI is available, supporting the file system commands and access to the LAN. Type ? (question mark) to display the available CLI commands.



Appendix K. Troubleshooting

K.1 Q&A

	Question	Answer
1.	Input from keyboard is not displayed on the screen, but information from the VSAT is visible.	<p>Verify that the Local Echo is enabled in the Telnet Client.</p> <p>In Windows XP, the Local Echo is enabled by the following procedure: C:\ Telnet Microsoft Telnet> set localecho Local echo on Microsoft Telnet></p> <p>To connect to the SatLink VSAT, type the command: Microsoft Telnet> open <ip-address></p>
2.	VSAT displays “Receiver tuning failed for ...”	<p>The VSAT is missing all or part of the information in the signal transmitted from the DVB-RCS Hub.</p> <p>Verify that the receiver status is “locked” using the command DVB RX SHOW.</p> <p>If the status is anything other than “locked”, verify the interface connections according to section 3.5 above.</p> <p>If the status is “locked”, please contact the Hub Operator to confirm that the equipment has been configured correctly.</p>
3.	VSAT displays “Logging on- Logon failed” Line up has been performed and levels calibrated with Control Center.	<p>Verify that the GPS configuration is correct.</p> <p>If transmit level calibration has not been performed, power off the SatLink VSAT and contact the DVB-RCS system operator.</p>
4.	How do I enable GRE in the VSAT?	The GRE feature requires license keys to be enabled. Contact the Hub Operator or ISP to obtain this license.
5.	How do I change the login password?	<p>The password can be changed with the command # user passwd <newpasswd></p> <p>To change the password on a different user, the command is: # user passwd <loginname> <oldpasswd> <newpasswd></p>
6.	I have changed the password, but have lost it.	A new password will have to be defined for the user. Contact the Hub Operator for assistance.
7.	How do I load new software on my SatLink VSAT?	See description in section 16 above.
8.	Rx tuning failed for NIT TS. The initial transponder cannot be found.	Please check freq/symbrate/lmb and antenna. If problem still persists, please contact Hub



		Operator for assistance.
9.	NIT not received. The RCST cannot find a valid Network Information Table.	Check that NIT is not missing and the linkage descriptor of type 7 (RCS Map Service) is also available. Without this descriptor, the RCST can not locate the FLS which holds the description of the Return Link service (i.e., the RCS Map table).
10.	Rx tuning failed for RMT TS (from NIT) The secondary transponder signaled from the Hub cannot be found.	Possible configuration error at Hub, or temporary outage. Please contact Hub Operator for assistance.
11.	PAT not received on RMT TS.	Please contact Hub Operator for assistance.
12.	PMT not received on RMT TS.	Please contact Hub Operator for assistance.
13.	RMT not received. The RCST cannot find a valid RCS Map Table.	This is probably due to the RMT missing, or due to a missing linkage descriptor of type 129 (RCS FLS Service) with an appropriate population ID. Please contact Hub Operator for assistance.
14.	Rx tuning failed for DVB-RCS FLS TS (from RMT).	Please contact Hub Operator for assistance.
15.	PAT not received on RMT TS.	Please contact Hub Operator for assistance.
16.	PMT not received on RMT TS. The RCST cannot find the Program Map Table for the RMT Service.	Please contact Hub Operator for assistance.
17.	RMT not received.	This is probably due to the RMT missing, or due to a missing linkage descriptor of type 129 (RCS FLS Service) with an appropriate population ID. If the problem still persists, please contact Hub Operator for assistance.
18.	Rx tuning failed for DVB-RCS FLS TS (from RMT).	Please contact Hub Operator for assistance.
19.	PAT not received on DVB-RCS TS. The RCST cannot find the Program Association Table on the FLS for the DVB-RCS signaling tables.	Please contact Hub Operator for assistance.
20.	PMT not received on DVB-RCS TS.	Please contact Hub Operator for assistance.
21.	TIM not received. The Broadcast TIM has not been received (or misses some critical parameter).	The broadcast TIM must contain a contention control and correction control descriptor before logon can commence. If problem still persists, please contact Hub Operator for assistance.
22.	Sync Max Tries Exceeded - Fine Sync not achieved.	Please contact Hub Operator for assistance.
23.	Logon Failed. No response from Hub.	Please contact Hub Operator for assistance.
24.	Logon Denied.	The VSAT is not authorized to log on to the satellite network. Please contact the Hub Operator. The VSAT will not attempt additional logon.
25.	Logon Failed -- Hub busy.	The Hub has insufficient resources to serve the logon request from the VSAT. The VSAT will, after a timeout, perform another logon attempt. If the situation persists there may be something wrong with the VSAT configuration at the Hub side. Please contact Hub Operator for assistance.
26.	Hold State.	The VSAT has been put in hold state by the Hub Operator. Only the Hub Operator can release it again. Contact the Hub Operator for assistance.



27.	Manual Mode not logging on.	The VSAT is set to accept manual logon only. Please log on manually or configure it to log on automatically.
28.	Sync Max Loss Exceeded - Logging off.	The VSAT has sent the maximum allowed number of synchronization messages to the Hub without response. This may happen for a number of reasons. Please check power level, antenna, etc. If the problem persists, please contact Hub Operator for assistance.

K.2 Debugging Network Connections

Ping is a useful tool to debug network connections.

A ping test can be done from a PC connected to the Ethernet port of the VSAT (e.g., from Microsoft command prompt).

Use the following commands:

1. Ping the Ethernet interface IP address of the VSAT (e.g. 10.10.20.1). If not OK please check the Ethernet cable and the connection to the SatLink VSAT.
For SatLink 1900 and 1901 only: Check that the VSAT's Ethernet port is operating in the correct mode. The switch should be set to HUB for direct PC to VSAT connections using a straight Ethernet cable.
2. If the Ethernet connection is OK then check the IP configuration and routing table of the PC (e.g., type the MS-DOS commands *ipconfig* and *route print*) and check the IP configuration of the VSAT (use the CLI command *ip show*).
3. If the ping to the SatLink VSAT is successful, try to ping a known Internet address (e.g. *www.google.com*). If successful, the connection to the Internet is OK.
If not OK check that the PC DNS IP address is correct. Try also to ping a known IP address on the Internet (e.g., ping 195.204.181.169).
4. If none of the above solves the problem, the System Operator must be contacted.

The following commands may also be useful:

- *ping -t <ipaddr>* start a continuous ping test towards the specified IP address in order to gather statistics
- use *ctrl-break* to read statistics during test (This option is not supported by all Windows operating systems)
- use *ctrl-c* to stop the test

K.3 Manual Software Upgrade or dload Fails

Manual software upgrade or download of file using CLI command *dload* can fail if there is not sufficient available memory in the VSAT file system. This can happen if several software images have been downloaded to the VSAT without deleting the older backup images.



The VSAT file directory normally contains two application files in addition to the smaller configuration and log files, namely:

- Satlink-vs2.tgz (For SL2000)
- dvb-rcst.tgz⁸ The current DVB-RCS application
- xxx.bak The back-up DVB-RCS application

To view the VSAT file directory, type the CLI command `dir`. There should not be more than the above listed application files.

Example:

```
# dir
FileName                               Size           Date           Time
oldLog.txt                             9816  00/00/0000  00:34:20
activeLog.txt                           3192  00/00/0000   00:00:25
xxx.bak                                1691265  00/00/0000   00:04:21
dvb-rcst.tgz                            1690755  00/00/0000   00:24:28
config.txt                               5188  00/00/0000   00:00:13
#
```

If the directory list reveals that there are other large files present, please delete these files using the CLI command `del` and retry the manual `sw upgrade` (or `dload`) procedure.

K.4 Collecting Information if a Problem Occurs

If a problem occurs with the SatLink VSAT for which support might be needed, having the information listed below available will be helpful.

1. The VSAT log from the HyperTerminal Window.

If possible, log the output from the VSAT to the HyperTerminal Window when the problem occurs.

The output from the HyperTerminal window can either be copied to a text file by setting the capture text options in HyperTerminal (→ Transfer → Capture Text) or copied directly from the HyperTerminal windows using the normal Windows copy function (CTRL+C). The content can then be pasted into a text editor such as Notepad or Word to generate a file suitable for being included as an e-mail attachment.

When logging into HyperTerminal, please issue the following CLI commands and capture the output.

```
ip show
ip show -mcast
dvb tx show
dvb tx show -capacity
dvb rx show
dvb rx show -pid
dvb pos show
odu show
sw show
log show -all
dir
```

2. The VSAT configuration file, config.txt.

If possible, please upload the configuration file to a PC with a TFTP server using the CLI command

⁸ The name may differ, but the extension will be “tgz”.



`upload config.txt <TFTP-IpAddress> [<remotefilename>]`, where `TFTP-IpAddress` is the IP address for the TFTP server and `remotefilename` is an optional parameter specifying the filename to store the file as on the TFTP server if a different name than `config.txt` is wanted. Please refer to Appendix B for an example of how to install and set up a TFTP server.

If it is not possible to upload the VSAT configuration file to a TFTP server; the `config.txt` file might be dumped to the RS-232 port / HyperTerminal by using the CLI command `type config.txt`. The output from the HyperTerminal Windows can then be copied to a text file or dumped using the capture text feature of the HyperTerminal.

K.5 List of Events that May be Logged

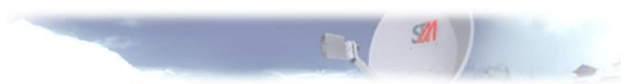
The following are the most common events that may be shown in the log from the VSAT. Use the CLI command `log show` to display the list of events stored in memory and the CLI command `type activeLog.txt` to display the list of events stored on the flash file system.

Events of type Major will normally cause disruption in the data transfer, while events of type Critical normally will require user intervention in order to restore the data communication with the DVB-RCS Hub.

Event	Severity	User action required	Comment
NCR lock lost	Major	None	The VSAT must log off, but will automatically try to reacquire the Forward Link and log on again. If the problem persists, please contact the Hub operator.
DVB-S/S2 Demodulator lost lock	Major	None	The VSAT has lost the Forward Link from the Hub. All 2-way IP communication will be broken. This is normally caused by a fade event caused by rain or snow. If the problem persists also after the weather improves, please check that the VSAT antenna has not been put out of its correct position before contacting the Hub operator.
DVB-S/S2 Demodulator Re-synchronization	Minor	None	There was a short interruption to the reception of the Forward Link from the Hub. Normally this happens during rain fades. Normally no or only 1-2 IP packets are lost during such an event.
CMT not received	Major	None	The VSAT must log off, but will automatically try to log on again. If the problem persists, please contact the Hub operator.
Logon retry timeout	Minor	None	The VSAT was not able to log on to the Hub. After a timer has expired the VSAT will retry logging on to the Hub.
Logon failure	Major	None	The VSAT was not able to log on to the Hub. Please check that correct GPS position and population ID has been configured. After a timer has expired, the VSAT will retry logging on to the Hub. If the problem persists, please contact the Hub operator.



Event	Severity	User action required	Comment
GW Busy	Major	None	The Hub does not allow the VSAT to log on. After a timer has expired the VSAT will retry logging on to the Hub. If the problem persists, please contact the Hub operator.
Logon denied	Critical	Call DVB-RCS Hub operator	The VSAT is not allowed to log on to the Hub.
GW initiated logoff	Major	None	The Hub operator has forced the VSAT to logoff.
Fine Sync failure	Major	None	The VSAT was not able to enter the fine synchronization state when trying to log on. After a timer has expired the VSAT will retry logging on to the Hub.
ODU power on failure	Critical	Check that cable to ODU is connected and that the VSAT is configured for the correct ODU (type CLI command <code>odu show</code>)	The VSAT is not able to establish DiSEqC communication with the ODU. Possible causes may be: <ul style="list-style-type: none"> - Cable to ODU not connected - IDU not configured for correct ODU - The ODU is defect and must be repaired
Logon successful	Normal	None	The VSAT succeeded to log on to the Hub.
Terminal Logoff	Normal	None	This event is logged after a user initiated logoff.
Entering hold state	Major	None	The Hub operator has put the VSAT in Hold-state. When the VSAT is in the Hold-state it is not allowed to try to log on to the Hub. To get an explanation of why the VSAT has been put in Hold-state please contact the Hub operator.
Leaving hold state	Normal	None	The VSAT is again allowed to log on to the Hub.
Unit has restarted after power off	Major	None	Normal message when unit is powered on.
Unit has restarted	Major	Check log with CLI command <code>log show -file</code>	If the event happens multiple times without any explanation please contact the Hub Operator and provide printout of the CLI command <code>log show -file</code> .
Restart cmd from local or remote operator	Major	None	Unit has been restarted by the operator from the hub or locally.
Automatic Restart	Critical	None	The VSAT was forced to restart due to following possible reasons, included in the log: <ul style="list-style-type: none"> • Forward Link search has timed out • VSAT is unable to allocate memory



Event	Severity	User action required	Comment
Tuning failure transponder one	Major	Check RX configuration (frequency, symbol rate). Check that the cable to LNB is properly connected.	The VSAT is not able to acquire a lock on the initial Forward Link transponder (the one that is configured in the VSAT). If the problem does not disappear within 10-60 minutes, please contact the Hub operator.
Tuning failure transponder two	Major	None	The VSAT is not able to acquire a lock on the second Forward Link transponder (see Appendix I for more info). If the problem does not disappear within 10-60 minutes, please contact the Hub operator.
Tuning failure transponder three	Major	None	The VSAT is not able to acquire a lock on the third Forward Link transponder (see Appendix I for more info). If the problem does not disappear within 10-60 minutes please contact the Hub operator.
Missing Table	Major	None	The VSAT is not receiving a mandatory DVB-S2/DVB-RCS table on the Forward Link. If the problem does not disappear within 10-60 minutes please contact the Hub operator.
TCT Inconsistency	Critical	Restart VSAT	There is an error in the received TCT table. If the problem does not disappear within 10-60 minutes, please contact the Hub operator.
DVB-RCS linkage descriptor not found	Major	None	The VSAT is not receiving a mandatory DVB-S/2DVB-RCS descriptor on the Forward Link. Please check the configured population ID of the VSAT. If the problem does not disappear within 10-60 minutes, please contact the Hub operator.
Forward Link is Up	Normal	None	The VSAT has completed acquisition of the Forward Link tables.
VSAT tuned to a new Forward Link	Normal	None	The VSAT logs the Forward Link information when transponder one is found. Included information are: <ul style="list-style-type: none"> • Network name • Forward Link rate • Forward Link frequency
Frequency out of range	Major	Check ODU configuration	TX or RX frequencies outside the supported ranges of the IDU and ODU have been detected. Please check that the ODU configuration matches the frequencies in use on the satellite and that the ODU in use is compatible with the IDU IF interface.



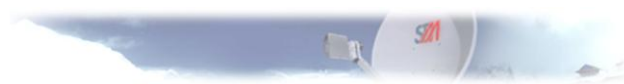
Event	Severity	User action required	Comment
ODU Communication Failure	Critical	Check that cable to ODU is connected and that the VSAT is configured for the correct ODU (type CLI command <code>odu show</code>)	<p>The VSAT is not able to establish DiSEqC communication with the ODU. Possible causes may be:</p> <ul style="list-style-type: none"> - Cable to ODU not connected - IDU not configured for correct ODU - The ODU is defect and must be repaired <p>The VSAT will restart automatically.</p>
ODU Temperature High Warning	Major	Check outside temperature. Check TX cable connecting IDU to ODU.	<p>The temperature in the ODU has become too high. If this happens several times without extreme weather conditions please check that there is no problem with the cable connecting the IDU and ODU. Please check if there are errors on the DiSEqC communication between the IDU and ODU by using CLI command <code>odu show -diseqc</code>. If DiSEqC errors are reported, the likely source of the problem is a bad TX cable connecting the IDU to the ODU, or poor connection of the cable to the connectors. Please always ensure that there is a good connection of the shield of the cable (GND) to connectors in both ends of the cable.</p>
ODU Temperature Critical	Critical	Check outside temperature. Check TX cable connecting IDU to ODU.	<p>The temperature in the ODU has become too high. If this happens several times without extreme weather conditions please check that there is no problem with the cable connecting the IDU and ODU. Please check if there are errors on the DiSEqC communication between the IDU and ODU by using CLI command <code>odu show -diseqc</code>. If DiSEqC errors are reported the likely source of the problem is a bad TX cable connecting the IDU to the ODU, or poor connection of the cable to the connectors. Please always ensure that there is a good connection of the shield of the cable (GND) to connectors in both ends of the cable.</p> <p>The VSAT might stop transmitting (if the Forward Link is reacquired).</p>
ODU turned itself off	Critical	Restart VSAT. If the failure occurs again the ODU must be sent for repair.	<p>The ODU has powered itself down – most likely because it has detected a failure. If this happens more than once the ODU must be sent for repair.</p>



Event	Severity	User action required	Comment
ODU PLL Lock Lost	Critical	Check if problem is caused by faulty DiSEqC communication. If not send ODU for repair.	First check if there are errors on the DiSEqC communication between the IDU and ODU by using CLI command <code>odu show -diseqc</code> . If DiSEqC errors are reported the likely source of the problem is a bad TX cable connecting the IDU to the ODU, or poor connection of the cable to the connectors. Please always ensure that there is a good connection of the shield of the cable (GND) to connectors in both ends of the cable. If no errors are reported on the DiSEqC communication, then the ODU is not able to transmit with the correct TX frequency and must be sent for repair.
ODU HPA failure	Critical	Check if problem is caused by faulty DiSEqC communication. If not send ODU for repair.	The VSAT is not able to start the HPA of the SatLink 4033 BUC.
ODU Short Circuit	Critical	Find and remove cause of short-circuit. Restart VSAT.	The power supply to the BUC has been short-circuited. After removing the cause of short-circuit, the VSAT must be restarted in order to recover.
ODU Diseqc communication Warning	Major	Check TX cable connecting IDU to ODU.	There are detected parity errors on more than 4% of the DiSEqC messages. This normally indicates a poor TX cable connection from the IDU to the ODU.
ODU Diseqc communication Critical	Critical	Check TX cable connecting IDU to ODU.	There are detected parity errors on more than 30% of the DiSEqC messages. This normally indicates a poor TX cable connection from the IDU to the ODU.
LNB Short Circuit	Critical	Find and remove cause of short-circuit. Restart VSAT.	The power supply to the LNB has been short-circuited. After removing the cause of short-circuit, the VSAT must be restarted to recover.
ODU TX calibration completed	Normal	None	This event is logged after a successful calibration of the transmitter. Required use of the SatLink 4033 ODU.
ODU TX calibration failed	Major	Check is problem is caused by faulty cabling of the ODU.	This event is logged after the calibration of the transmitter failed. Required use of the SatLink 4033 ODU.
Unit Temperature High	Major	Check temperature at IDU location	Temperature inside the IDU is getting too high.
Unit Temperature Critical	Critical	Check temperature at IDU location	Temperature inside the IDU has gotten too high.
Failed to load firmware	Critical	Send the IDU for repair.	The IDU cannot access the satellite interface because failing to load the firmware. The IDU must be sent for repair.



Event	Severity	User action required	Comment
TFTP Server unreachable	Major	Check IP connection with the TFTP server.	The VSAT is not able to establish connection with the TFTP server. Likely to be an IP configuration or network problem. Verify the IP connection with the TFTP server by ping.
File not found	Major	Verify that the file is present on the TFTP server.	The VSAT is not able to upload the file specified in the command from the TFTP server. Verify that the file is available on the TFTP server.
File transfer error	Major	Check available space on file system.	The File transfer has been aborted either due to an IP connection interruption between the VSAT and the TFTP server or due to a lack of available space on the VSAT's file system.
Manual SW Upgraded completed	Normal	None.	It reports successful VSAT software upgrade via TFTP.
Automatic SW download started	Normal	None.	The VSAT has started automatic download via Multicast of a new software version.
Automatic SW download completed	Normal	None.	The VSAT has successfully downloaded a new software version via Multicast. The VSAT will automatically restart and activate the new software version.
Automatic SW download failure	Major	None.	The VSAT failed to download a new software version via Multicast. If the problem persists after 20-60 minutes, please contact the Hub operator.
SW upgrade failed	Critical	Retry SW upgrade.	TFTP download of new software image failed.
Mcast SW download started	Major	None.	The VSAT has started automatic download via Multicast of a new software version.
Mcast SW download completed	Major	None.	The VSAT has successfully downloaded a new software version via Multicast. The VSAT will automatically restart and activate the new software version.
Mcast SW download failed	Major	None.	The VSAT failed to download a new software version via Multicast. If the problem persists after 20-60 minutes, please contact the Hub operator.
IP address conflict on LAN	Normal	Check IP configuration of the VSAT.	The VSAT has detected conflicting IP address on the LAN interface.
DNS server reply: Recursion Not Available	Critical	Change configuration of Hub DNS server to allow reply recursion.	DNS server does not allow reply recursion.



Event	Severity	User action required	Comment
DNS WARNING	Normal	Check configuration of the DNS primary and secondary IP address.	No connectivity with DNS server.
Ip Address for	Major	None.	The VSAT IP address of the LAN or DVB interface is changed. New IP address is visible in the log.
Ip NetMask for	Major	None.	The VSAT network mask of the LAN or DVB interface is changed. The new network mask is visible in the log.
Created virtual Inf	Major	None.	A virtual interface is created.
Deleted virtual Inf	Major	None.	A virtual interface is deleted.
Route added	Major	None.	A new IP route is configured in the VSAT.
Save Config Executed	Major	None.	The VSAT configuration is saved.
No Global NAT Addr defined	Major	Add global NAT address to the VSAT configuration.	The VSAT NAT functionality is enabled but no global NAT address is defined.
VSAT IP cannot be used as Global NAT Addr	Major	Check NAT configuration of the VSAT.	The VSAT does not allow using the DVB address as global NAT address.
BIP List	Minor	None.	The VSAT has added a web site in the HTTPPA bypass list.
Events for Mesh capable only SatLink VSAT			
DLCP logon successful	Normal	None.	The VSAT has successfully logged on to the Mesh Controller.
DLCP logon Failure: Unauthorized Logon	Minor	If the problem persists, contact your hub operator.	The VSAT's logon was to the Mesh Network was refused. Contact your Hub operator. The VSAT DVB and LAN IP address and subnet must fall into the mesh network address space to get authorized to logon.
DLCP link establishment success	Normal	None.	The VSAT has established a new dynamic connection.
DLCP link service failed	Minor	If the problem persists, contact your hub operator. The mesh controller might be out of service.	The VSAT was not able to establish a new dynamic connection.
DLCP link service tear down timeout	Normal	None.	A dynamic connection is closed due to timeout. Timeout occurs when no packets are received in any direction for a certain amount of time configured by the Hub operator.
DLCP link service tear down last link service	Normal	None.	The VSAT is closing the last dynamic connection.
DLCP link service tear down	Normal	None.	A dynamic connection is closed either from the VSAT or the Mesh Controller.



Event	Severity	User action required	Comment
DLCP clear all dynamic routes and entries	Normal	None.	The VSAT has closed all dynamic links and deleted all dynamic routes. This happens when the SatLink VSAT logs on / off from the Mesh Network.
DLCP clear all session data and logon	Normal	None.	The VSAT has closed all dynamic links and deleted all dynamic routes. The VSAT tries to log on to the Mesh Controller.
DLCP max number of connections reached	Normal	None.	The VSAT has reached the maximum number of licensed connections. New connections are discarded.
DLCP max pending request reached, force DLCP re-logon	Major	None.	The VSAT has too many pending requests waiting for response from the Mesh controller. The VSAT logs off from Mesh Controller and attempts to log on again.
BRX HW initialization failed	Critical	None.	The VSAT has failed to initialize the burst receiver for mesh communication. Contact you Hub operator, mesh return carrier configuration shall be verified.
Mesh synchronization	Normal	None.	This event is logged when the VSAT achieves synchronization on the Mesh carrier.
Mesh synchronization lost	Major	None.	This event is logged when the STM mesh capable SatLink VSAT is losing synchronization on the mesh carriers. The VSAT will automatically logoff from the Star Network and re-logon to re-establish Mesh synchronization.
TCP module detected high packet loss on FWD link	Major	None	This event is generated when a lot of DUP ACKs are detected on the Satellite Network. This is an indication that there is loss on the Satellite Network. This will reset the PEP/TCP connections for which the DUP ACK count is high.



Appendix L. Compliance

L.1 Article 3 of the R&TTE 1999/5/EC Directive

The SatLink 1000, 1910, 2000, and 2900 comply with the essential requirements of Article 3 of the R&TTE 1999/5/EC Directive, if used for its intended use.

L.1.1 Safety (Article 3.1.a of the R&TTE Directive)

This equipment has been designed and tested to meet the requirements of the following standards:

- EN 60950-1:2006

L.1.2 Electromagnetic Compatibility (Article 3.1.b of the R&TTE Directive)

This equipment has been designed and tested to meet the requirements of the following standards:

- EN 301 489-1:V1.8.1
- EN 301 489-12:V2.2.2

L.1.3 Efficient use of the Radio Frequency Spectrum (Article 3.2 of the R&TTE Directive)

This equipment has been designed and tested to meet the requirements of the following standard:

- EN 301 428:V1.3.1

L.2 SatLabs Qualification

The SatLink 1000, 1910 and 2000 have successfully passed the SatLabs Qualification program (www.satlabs.org). The SatLink 1000 and 1910 have been tested compliant for the following VSAT profiles and options:

- | | |
|---------------------|---|
| • ATM basic profile | |
| • MPEG_TRF | MPEG TRF burst formatting support |
| • WIDE_HOPP | 120 MHz RCST burst to burst frequency hopping range |
| • FAST_HOPP | RCST supports frequency hopping between adjacent time slots (SatLink 1910 only) |
| • AVBDC | RCST supports AVBDC capacity request class |
| • Dynamic_MF_TDMA | Dynamic MF_TDMA supported |
| • NEW_PERM | RCST supports new permutation as provided through TCT |

The SatLabs Qualification for SatLink 1000 and 1910 is verified according to the following standards, recommendations, and test plans:

- SatLabs Outline Test Plan 3.0.
- SatLabs System Recommendations v1.2.2.
- EN 301 790 v1.4.1. Digital Video Broadcasting (DVB); Interaction channel for Satellite Distribution Systems
- TR 101 790 v1.2.1. Digital Video Broadcasting (DVB); Interaction channel for Satellite Distribution Systems; Guidelines for the use of EN 301790

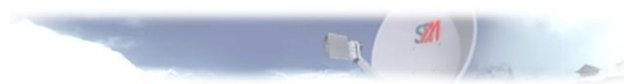
The SatLink 2000 has been tested compliant for the following VSAT profile:

- DVB-S2 CCM Profile



The SatLabs Qualification for SatLink 2000 is verified according to the following standards and test plans:

- SatLabs Outline Test Plan 6, September 2009
- EN 301 790 v1.4.1 2005-04-01 Digital Video Broadcasting (DVB); Interaction channel for satellite distribution systems
- TR 101 709 v1.2.1 2003-01-01 Digital Video Broadcasting (DVB); Interaction channel for satellite



Appendix M. Standardization of Timing Compensation

In May 2005, SatLabs specified the procedure a DVB-RCS VSAT should use to compensate for the delay from and to the satellite plus internal delay in the VSAT in order to make sure that the logon burst sent by the VSAT is received at the DVB-RCS Hub with correct timing when using DVB-S Forward Links.

The VSAT is by factory default configured to be compliant with the SatLabs procedure for timing compensation for DVB-S Forward Links, as well as being configured to comply with any proprietary timing compensation scheme.

To show what timing compensation method the VSAT is configured to use, enter the CLI command `dvb pos show`.

Example:

```
# dvb pos show
Latitude           : 59d 52.15'N ( 59d 52' 9''N )
Longitude          : 10d 29.05'E ( 10d 29' 3''E )
Altitude           : 60 m
Timing Reference   : SatLabs
PositionSearchN    : 0
Position Search Offset : 0
Pos Large Uncertainty : First
Pos LTU Done       : No
#
#
```

The VSAT can also be configured to offset the timing of the logon burst a given number of NCR ticks from the SatLabs timing reference by entering the CLI command `dvb pos delayburst <ticks>` where `<ticks>` is the integer number of NCR ticks the logon burst will be delayed or advanced compared to the SatLabs timing reference. The example below shows how to configure the VSAT to delay the logon burst 30000 NCR ticks (100 us) compared to the SatLabs timing reference.

Example:

```
# dvb pos delayburst 30000
# dvb pos show
Latitude           : 59d 52.15'N ( 59d 52' 9''N )
Longitude          : 10d 29.05'E ( 10d 29' 3''E )
Altitude           : 60 m
Timing Reference   : Offset 30000 NCR ticks
PositionSearchN    : 0
Position Search Offset : 0
Pos Large Uncertainty : First
Pos LTU Done       : No
#
#
```



Never change the timing reference configuration without being instructed to do so by the system operator, as an incorrect timing reference configuration will prevent the VSAT from logging on to the Hub.



Appendix N. Receiver and Transmitter Autostart

The VSAT can be configured to automatically restart tuning of the Forward Link after having lost the Forward Link signal.

Likewise, on the transmitter side, the VSAT can be configured to automatically try to log on to the Hub when the Return Link has been lost. The VSAT will not try to log on again (despite autostart being enabled) if the VSAT has been explicitly requested to log off and remain logged off by the Hub (e.g., receiving ‘Logon denied’ or ‘Transmit disable’ in the unicast TIM).

The CLI commands for enabling/disabling auto restart of the RX and TX are:

```
dvb rx autostart <on|off>
dvb tx autostart <on|off|traffic>
```

The normal factory default setting is that both rx and tx autostart are set to disabled. Once the SatLink VSAT has been correctly installed and commissioned by the Network Operator, it is convenient to enable rx autostart and tx autostart as described in section 9.5.

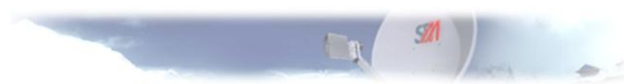
When rx autostart and tx autostart are set to off (disabled), the VSAT will make one attempt to acquire the Forward Link when issuing the CLI command `dvb rx start`. If this attempt fails, a new attempt must be manually triggered by issuing the `dvb rx start` command once again.

When rx autostart is enabled and tx autostart is disabled, the VSAT’s reaction to the CLI command `dvb rx start` is to continuously attempt to acquire the Forward Link until it succeeds or is manually stopped (using CLI command `dvb rx stop`). If the Forward Link acquisition succeeds, the VSAT will enter a receive-only mode. Issuing the CLI command `dvb tx logon` will trigger the VSAT to attempt a single log-on attempt. Upon failure, the `dvb tx logon` command must be manually entered again in order to trigger a new logon attempt. Alternatively, the CLI command `dvb tx autostart on` can be used to trigger the logon procedure and at the same time configure the VSAT to automatically retry to log on if the logon attempt fails or the VSAT has been logged off for some reason.



The CLI command `dvb rx autostart on` will not automatically trigger the Forward Link acquisition procedure. The CLI command `dvb rx start` must be explicitly issued. This is contrary to the CLI command `dvb tx autostart on`, where the initiation of the logon procedure is implicit.

TX autostart set to enabled will overrule any rx autostart configuration. In other words, if the TX autostart is enabled and the Forward Link or NCR synchronization is lost, the VSAT will attempt to retune/reacquire the Forward Link regardless of rx autostart being enabled or not.



Appendix O. Accessing the Forward Link Signaling

When the receiver of the VSAT is switched on (using `dvb rx start`), the VSAT carries out a Forward Link acquisition procedure to obtain the DVB-RCS system information necessary to log on to the network. The DVB RCS system information is transmitted in specific DVB RCS SI tables that are standardized in EN 301 790. The identifiers that the VSAT uses to find the DVB RCS SI tables are embedded within standard DVB-S/DVB-S2 Forward Link signaling table sets that are standardized in EN 300 468 and ISO/IEC 13818-1. Table 23: lists the DVB-S/DVB-S2 tables and the DVB RCS SI tables that are relevant for accessing the DVB RCS network.

DVB-S SI tables

Table name	Abbrev	PID
Network Information Table	NIT	0x0010
Program Association Table	PAT	0x0000
Program Map Table	PMT	Assigned

DVB RCS SI tables

Table name	Abbrev	PID
RCS Map Table	RMT	Assigned
PCR Insertion TS Packet	PCR	Assigned
Satellite Position Table	SPT	Assigned
Superframe Composition Table	SCT	Assigned
Frame Composition Table	FCT	Assigned
Timeslot Composition Table	TCT	Assigned
Terminal Information Message	TIM	Assigned
Terminal Burst Time Plan	TBTP	Assigned
Correction Message Table	CMT	Assigned

Table 23: List of DVB-S/DVB-S2 and DVB-RCS specific tables that are used when accessing the network

A rough outline of the procedure is as follows:

The VSAT tunes to the transport stream of the Forward Link that it has pre-configured as the “start-up” Forward Link. There it reads the NIT. The NIT PID value is hard-coded in the SatLink VSAT. In the NIT, the VSAT finds tuning parameters for accessing the satellite and Forward Link transport stream containing the RMT. If the RMT is on a satellite or transponder other than the “start-up” Forward Link, the VSAT will re-tune to the Forward Link carrying the RMT. The RCST then reads the PAT and PMT on the same Forward Link as the RMT. In the PAT, the VSAT finds the PID that identifies the PMT, which in turn contains the PID value of the RMT. In the RMT, the VSAT uses its preconfigured population ID to find and thereafter extract tuning parameters for accessing the correct Forward Link Signaling service (i.e., parameters defining forward and Return Link satellite(s), NCC, and Superframe_ID for initial log-on). If the Forward Link for DVB-RCS services defined in the RMT is different from its current Forward Link, the VSAT must retune to the new Forward Link. There, the VSAT will access the PAT of the new Forward Link and extract the PID that identifies the PMT that is relevant for its forward signaling. In the PMT, the VSAT will find the PID values of the PCR Insertion TS Packet, in addition to the other DVB RCS SI tables.



The VSAT can report the following Receiver State status:

- Off
- Tuning transponder one
- Tuning transponder two
- Tuning transponder three
- Waiting for NIT (transponder one)
- Waiting for PAT (transponder two)
- Waiting for PMT (transponder two)
- Waiting for RMT (transponder two)
- Waiting for PAT (transponder three)
- Waiting for PMT (transponder three)
- Waiting for DVB RCS Tables/NCR Lock
- Forward Link up
- Tuner lock lost

If the Forward Link acquisition proceeds normally and is successful, the CLI output message when typing `dvb rx show` will not normally display the receiver states `Tuning ...` and `Waiting for ...` as the acquisition is performed so quickly that the states have already passed.

If the Forward Link acquisition fails or comes to a stop, however, the Receiver State status (obtained by issuing the `dvb rx show` CLI command) will display the current stage in the acquisition process.